

Admiral SERVICE MANUAL No. S305 (3rd Printing)

for models using

24D1, 24E1, 24F1, 24G1, 24H1, and 5B2, 5D2 CHASSIS

Note: This second printing contains

A REVISED PARTS LIST
ADDITIONAL SERVICE HINTS (Page 50)

IMPORTANT

Especially note the discussion in Service Hints (pages 32, 33, 34, 50), Trouble Shooting (pages 34 through 37) and Production Changes (pages 38, 39, 40).

When installing a set, be sure to see pages 4 through 8, and especially "Individual Channel Slug Adjustment Using Television Signal" on page 5.

MODEL IDENTIFICATION CHART

For chassis notes and for illustrations of models, see page 3.

Model Numbers Model numbers may have suffix letter "N"	Tube Size	TV Chassis	TV Tuner	Record Changer	Radio (AM-FM)
26R25, 26R26, 26R35, 26R36, 26R37, 26X45, 26X46	16" rect.	24H1	94C18-3		...
26R25A, 26R26A, 26R35A, 26R36A, 26R37A		For these models, see Service Manual No. S362			
26X35, 26X36, 26X37	16" round	24D1	"		...
26X55, 26X56, 26X57, 26X65, 26X66, 26X67, 26X75, 26X76	16" round	24D1	"		...
26X55A, 26X56A, 26X57A, 26X65A, 26X66A, 26X67A, 26X75A, 26X76A		For these models, see Service Manual No. S362			
29X15, 29X16, 29X17, 29X25, 29X26, 29X27	19" round	24F1	"		...
29X25A, 29X26A		For these models, see Service Manual No. S362			
36X35, 36X36, 36X37	16" round	24E1	"	RC500 or RC550	5B2
36X35A, 36X36A, 36X37A	16" round	24E1	"	RC500 or RC550	5D2
39X16, 39X16A, 39X17A	19" round	24G1	"	RC500 or RC550	5B2
39X16B, 39X17B	19" round	24G1	"	RC500 or RC550	5D2
39X17C, 39X25A, 39X26A		For these models, see Service Manual No. S362			
39X25, 39X26	19" round	24G1	"	RC550	5D2

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SPECIFICATIONS

Direct View Electromagnetic Picture Tube

- 16" rectangular tube.
- 16" round tube.
- 19" round tube.

Operating Voltage

110-120 volts. 60 cycles.

Wattage

- 235 watts for "television only" models.
- 250 watts for combination models.

Input Impedance and Transmission Lines

300-ohm balanced (between antenna terminals).

Note that 75 ohm coaxial cable may be used by connecting the outer conductor to the chassis and the inner conductor to either antenna terminal.

Antenna

All models equipped with built-in TV antenna.

Intermediate Frequencies

Video 25.75 MC. Sound 21.25 MC.

Fuse Location

The horizontal output circuit is fused with a 1/4 amp., 250 volt fuse, part #84A4-2. The AC line is fused with a 4 amp., 250 volt fuse, part #84A1-18. Both fuses are located in the back end of the high voltage compartment.

Record Changer

Model RC500 or Model RC550 record changers are used. The changer model number is on the top rear of the changer pan and also on the changer model label on the underside of the changer. For the RC500 changer, refer to Service Manual No. S298; for the RC550 changer, refer to Service Manual No. S327.

TUBE COMPLEMENT

Sym.	Type	Function
V101	6AG5, 6BC5, or 6CB6	RF Amplifier
V102	6J6	Oscillator and Mixer
V201	6AU6	1st Sound IF
V202	6AU6	2nd Sound IF
V203	6AL5	Ratio Detector
V204	†6SQ7 or 6AU6	Audio Amplifier
V205	6V6GT	Audio Output
V301	6AU6	1st Video IF
V302	6AU6	2nd Video IF
V303	6AG5	3rd Video IF
V304	6AL5	Video Det. and Clamper
V305	6AU6	AGC
V306	6AC7	Video Amplifier
V307	§	Picture Tube
V401A}	6SN7GT	{Vertical Oscillator
V401B}		{Sync Inverter
V402	6S4	Vertical Output
V403	12AU7	Sync Separator and Clipper
V404	6AL5	Horizontal Sync Discriminator
V405	6SN7GT	Horizontal Oscillator
V406	6CD6G	Horizontal Output
V407	1B3GT	2nd Anode Rectifier
V408	6W4GT	Damper
V501	5U4G	High Voltage Rectifier
V502	6AX5GT	Low Voltage Rectifier

5B2, 5D2 Radio Chassis

V601A}	12AT7	{Converter
V601B}		{Oscillator
V602	6BA6	1st IF Amplifier
V603	6BA6	{2nd IF Amplifier (FM)
		{2nd Detector (AM)
V604	6AL5	FM Ratio Detector
V605	6AU6	1st Audio Amplifier
§ Picture Tube: 16" round, 16GP4. 19" round, 19AP4.		
16" rectangular, 16RP4 and 16TP4.		
† See schematic for alternate circuits.		

Television Frequency Ranges

Channel Number	Channel Freq., MC	Wave Length Meters	Picture Carrier, MC	Sound Carrier, MC	Het. Osc. Freq., MC	Dipole Length	Folded Dipole Length	Reflector Length	Director Length	Half Wave Shorted Channel Trap*
2	54-60	5.55-5.0	55.25	59.75	81	98"	96"	103"	95"	87"
3	60-66	5.0-4.55	61.25	65.75	87	90"	88"	94"	86"	79"
4	66-72	4.55-4.17	67.25	71.75	93	82"	80"	86"	78"	72"
5	76-82	3.95-3.66	77.25	81.75	103	71"	69"	74"	68"	63"
6	82-88	3.66-3.41	83.25	87.75	109	66"	64"	69"	64"	58"
7	174-180	1.72-1.66	175.25	179.75	201	32"	30"	33"	30"	28"
8	180-186	1.66-1.61	181.25	185.75	207	31"	29"	32"	29 1/2"	27"
9	186-192	1.61-1.56	187.25	191.75	213	30"	28"	31"	29"	26"
10	192-198	1.56-1.51	193.25	197.75	219	29"	27"	30"	28"	25"
11	198-204	1.51-1.47	199.25	203.75	225	28"	26"	29"	27"	24"
12	204-210	1.47-1.43	205.25	209.75	231	27"	25"	28"	26"	23 1/2"
13	210-216	1.43-1.39	211.25	215.75	237	26"	24"	27"	25"	23"

* Constructed from 300 ohm transmission line. See "Constructing A Half Wavelength Shorting Stub" on page 5.

TELEVISION CHASSIS NOTES

The circuit design of the 24D1, 24E1, 24F1, 24G1, 24H1 chassis is very similar to the 21A1 chassis.

The 2nd anode voltage in the 24D1, 24E1, 24F1 24G1, 24H1 chassis is approximately 13 KV. This increased voltage, developed by a new high-efficiency horizontal output transformer and horizontal output tube (6CD6G), gives a brighter picture. No voltage doubler circuit is required. A new vertical output tube (6S4) is used. This miniature triode will operate under higher plate voltages. An auto-transformer (vertical output) is used in the plate circuit.

Television chassis 24D1, 24E1, 24F1, 24G1 are electrically identical. The 24H1 chassis, is electrically the same as these except for values of R408, R442, and C437. These value differences result from the need for different sweep requirements for the rectangular tube. These chassis also have minor differences such as ion trap, picture tube mounting, and mechanical parts.

Adjacent channel traps L309 and L310 have been added to later production sets. See production change on page 39.

RADIO CHASSIS NOTES

The 5B2 and 5D2 radio chassis are slightly different electrically. See schematics. The 5D2 radio can be identified by the 12 wire connecting cable. The 5B2 connecting cable has 11 wires. Either radio can be used with 24E1 and 24G1 television chassis provided that a jumper wire is connected between pins "M" and "N" of socket M504 on the television chassis. This jumper wire was added to chassis stamped Run 8 or higher.

To service the television or radio chassis separately, see information given on the schematic page.

Two different record changers are used. See "Record Changer" on page 2.

RUN NUMBERS

A system of run numbers is used with these television chassis. The run number is rubber stamped on the rear

of the chassis. Whenever a production change is made in the television chassis, the run number changes to the next higher number. At time of publication, 24D1 chassis were stamped Run 9, 24E1 and 24F1 chassis were stamped Run 10, 24G1 chassis were stamped Run 11, 24H1 chassis were stamped Run 6.

HIGH VOLTAGE WARNING

Operation of the set outside of the cabinet or with the cabinet back removed involves shock hazard. Exercise normal high voltage precautions.

High voltages are present throughout the horizontal output and second anode supply circuits. No attempt should be made to make measurements from these points with ordinary test equipment.

Caution: The metal cone on 16" and 19" round picture tubes operates at 13,000 volts. To avoid accidental contact with this high voltage when working near picture tube, it is advisable to remove cap from the 1B3GT tube and insulate it from the chassis. Then discharge the electrostatic charge on the cone to the chassis with a screwdriver.

Very carefully follow instructions given in this manual regarding location of test points for alignment, for taking voltage measurements, or in making oscilloscope waveform analysis. Do not connect test equipment across other points in the receiver unless you are thoroughly familiar with the circuit wiring and points at which high voltages are present.

CAUTION — PICTURE TUBE HANDLING

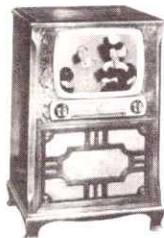
Due to the high vacuum and large surface area of the picture tubes, great care must be exercised when handling these tubes. The picture tube must not be scratched or subjected to excessive pressure as fracture of the glass will result in an explosion of considerable violence which may cause personal injury or property damage. When servicing tubes, see additional information on page 32.



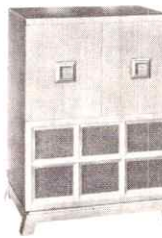
26R25, 26R26,
26X75, 26X76



26R35, 26R36,
26R37



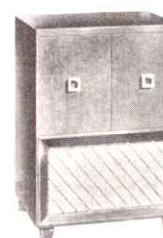
26X45, 26X46



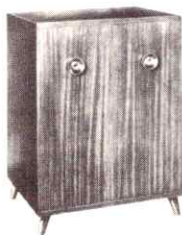
26X35, 26X36,
26X37



26X55, 26X56,
26X57



26X65, 26X66
26X67



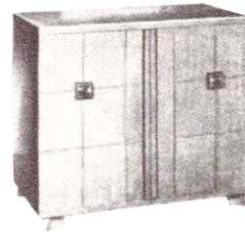
29X15, 29X16,
29X17



29X25, 29X26



36X35, 36X36,
36X37



39X16, 39X17



39X25, 39X26

OPERATING THE TELEVISION RECEIVER

Note: If both radio and television are turned on in combination models, neither unit will operate.

When using the television receiver, the radio-phono knob should not be left in the "phono" position, since the phono-motor will be on.

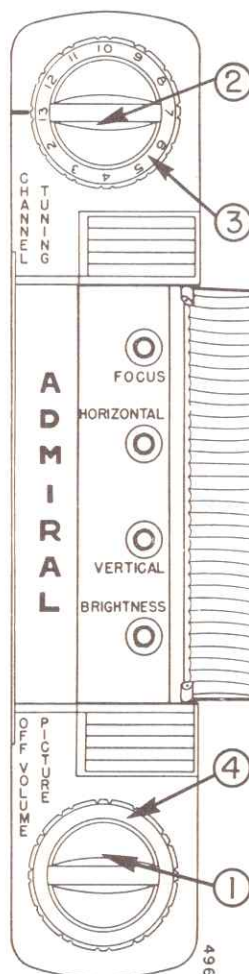
The controls of this receiver are operated conventionally. The circuits are so designed that none of the controls are extremely critical, resulting in ease of operation. This is due to the rapid acting AGC circuit and improved sound carrier rejection in the video IF amplifiers.

AUXILIARY CONTROLS

The four auxiliary controls, which are located behind the small door between the operating controls, should seldom need adjustment after installation. Set owner should be informed of this feature. These controls should be carefully set at time of installation.

TUNING HINTS

1. Never operate the PICTURE control at the point where picture detail is lost.
2. Be sure that the TUNING control has been adjusted for best sound. If the receiver is in a location where the video signal is extremely weak, it is possible to slightly detune the receiver with the TUNING control to produce a darker picture, without appreciably affecting the sound.
3. If the OFF-VOLUME control is turned up too far, the set may become microphonic causing sound bars to appear in the picture. Reduce volume until sound bars disappear.



Select station by turning CHANNEL control (front knob) so that the channel number lines up with the indicating mark.

Carefully adjust the TUNING control (rear knob) for best sound. If necessary, readjust about 10 minutes after set is turned on.

Adjust the PICTURE control (rear knob) for the most pleasing contrast between light and dark areas.

Turn the set on by rotating the OFF VOLUME control (front knob) about half-way to the right.

Figure 1. Tuning Procedure.

INSTALLATION and SERVICE ADJUSTMENTS

When installing, each set should be checked for picture centering, picture tilt, shaded corners, proper size, linearity, etc., to insure best performance. It is especially important that the Ion Trap be checked, and that the Channel Slugs be adjusted upon installation or servicing of every set to insure ease of tuning. Any adjustments required should be made as described here.

For best results, all checks or adjustments should be made using a transmitted television test pattern. A mirror placed in front of the picture tube screen will be of help in observing the picture while adjusting rear chassis controls.

RECEIVER LOCATION

The receiver should be placed so that sunlight or light from lamps will not fall directly upon the face of the picture tube and cause glare or reflections. Locations should be made for best seating arrangement, comfortable viewing and maximum visibility.

It is also important that an electrical outlet and the antenna lead-in be easily accessible. If the built-in Roto-Scope antenna or other indoor antenna is used, check various locations for best signal strength with minimum of "snow", "ghosts" or other interferences.

Important: Allow for good ventilation of the receiver by placing it approximately six inches away from

the wall. Do not locate receiver close to sources of heat, such as radiators or heating vents. Do not cover ventilating holes or slots in the cabinet or cabinet back.

BUILT-IN TV ANTENNA

The built-in "Roto-Scope" antenna is operated by the antenna control lever which extends from the back of the cabinet (near the top). Set the antenna control lever in that one of its three positions (left, center, or right) which gives the clearest picture. See customer instruction for additional Roto-Scope information.

When an external indoor or an outdoor antenna is required, be sure to disconnect the built-in Roto-Scope

antenna leads from the antenna terminal board, tape them and place them away from the chassis.

INPUT IMPEDANCE and TRANSMISSION LINES

The input impedance to the receiver is 300 ohm balanced (between antenna terminals). If 300 ohm transmission line is used, connect it across the antenna terminals.

Input impedance between one antenna terminal and chassis is approximately 75 ohms. When using 75 ohm coaxial transmission line, connect the outer conductor to the chassis and the inner conductor to either antenna terminal; use the terminal which gives the most satisfactory picture on the weakest station.

For best performance, use Admiral transmission line (part number 95A22-1 for 300 ohm line, part number 95A22-2 for 75 ohm line).

ADMIRAL OUTDOOR ANTENNAS

When installing an outdoor antenna, we recommend using an antenna selected from Admiral's high quality line. Antenna kits 94A7-28 (inline) and 94A7-32 (stacked) will provide excellent all channel reception in the majority of metropolitan or suburban locations. Each of these kits contains detailed installation instructions. Other Admiral antennas are also available for specialized problems. Complete data on antennas, (recommended types for a particular locality, radiation patterns, etc.) can be found in the "Admiral Antenna Catalog" available from the Admiral distributor.

CONSTRUCTING A HALF WAVELENGTH SHORTING STUB

The following discussion applies only if 300 ohm transmission line is used between antenna and receiver.

A section of transmission line, $\frac{1}{2}$ wavelength long, can be used to minimize any unwanted signal, either of another channel or outside the television frequency band. Proceed as follows:

Cut a piece of line slightly longer than given under the "Half-wave Shorted Channel Trap" column in the table on page 2 and connect the two leads of one end across the receiver antenna terminals.

Using diagonal cutters or razor blade, "short" across the transmission line at a place slightly longer than the calculated length. *Care should be taken when "shorting" the line to cut through the plastic covering only; do not cut the conductors.* If the interference is not "trapped out", short the line in $\frac{1}{8}$ " intervals (working toward the terminals) until the critical point is reached. Cut the transmission line and place a carbon resistor across the line. The resistor should be approximately 60 ohms. For strong interference, it may be necessary to drop the resistance to 20 ohms, and for weak interference it may be possible to use 150 ohms. Do not use a lower value resistor than necessary to minimize the interference.

Since the interference frequency being eliminated or "trapped-out" is that of some other television station operating in the vicinity, the interfering frequency will also be attenuated on its own channel. If the interference frequency is so strong that it can not be attenuated

enough by using a resistor across the line, it will be necessary to install a double-pole, single-throw switch to open the trap leads when the receiver is switched to this channel. Recheck trap length after installing switch.

If the interference frequency is not that of a television station, the line may be cut and the leads shorted together without using the resistor. Generally, this will completely eliminate the interference frequency.

If the interference frequency is known, the transmission line can be cut from a section of 300 ohm transmission line by using the following formula:

$$\text{Half wave shorting stub in inches} = \frac{4841}{\text{Freq. (MC)}}$$

INDIVIDUAL CHANNEL SLUG ADJUSTMENT USING TELEVISION SIGNAL

Individual channel oscillator adjustment of every receiver should be checked upon installation or servicing. If this adjustment is properly made, it is possible to tune from one station to another by merely turning the CHANNEL control and if necessary, slightly readjusting the TUNING control. With correct oscillator channel adjustment, best picture and sound will be located at the approximate center (half rotation) of the range of the Tuning control.

This adjustment can be made without removing the chassis from the cabinet. Adjust as follows:

- Turn the set on and allow 15 minutes to warm up.
- Set the CHANNEL knob for a station; set other controls for normal picture and sound.
- Set Tuning control at center of its range by rotating it approximately half-way.
- Remove the CHANNEL and TUNING knobs.
- Insert a $\frac{1}{8}$ " blade, NON-METALLIC screwdriver in the $\frac{1}{4}$ " hole adjacent to the channel tuning shaft. For each channel in operation, carefully adjust the oscillator slug for best sound. Only slight rotation of the slug will be required; turning the slug in too far will cause the slug to fall into the coil.

If the sound and picture will not "tune-in" together, check for a weak signal; a better antenna may be required. In locations where the TV signal is extremely weak, fringe area alignment can be made. Complete information on this special alignment is available from the Admiral Distributor.

If a number of slugs are found to tune all the way in or all the way out, or if the 6J6 oscillator-mixer tube has been replaced, it may be necessary to make the "Overall Oscillator Adjustment (A15)" as discussed on page 17.

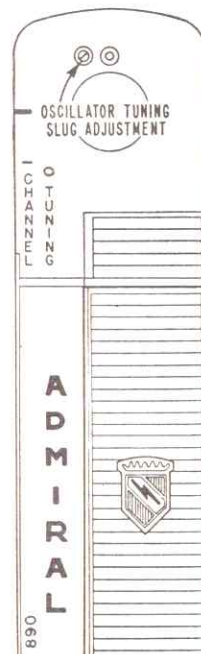


Figure 2.
Control Panel.

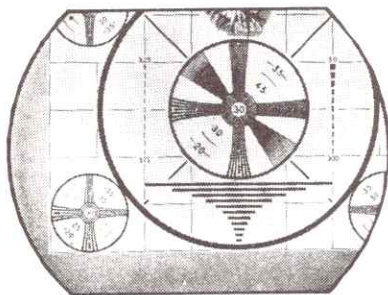


Figure 4. Picture Not Centered.

ION TRAP ADJUSTMENT

In order to prolong the life of the picture tube, it is important that this adjustment be made on every receiver upon installation or servicing.

Locate the ion trap on the neck of the tube so the blue sleeve is at the left (facing the rear of the chassis) and with the magnet at bottom. Starting from a point close to the tube base, very carefully move the ion trap forward or backward, and at the same time rotate it slightly in either direction; adjust for the brightest raster possible with the brightness control set for average brightness.

Note that there may be two locations where the brightest picture can be produced. The second ion trap location, which is further forward on the tube neck, should not be used.

Important: If the corners of the picture are shaded, be sure the ion trap has been properly adjusted. Do not sacrifice picture brightness when adjusting the ion trap to remove shaded corners. To eliminate shaded corners, see the discussion under "Picture Centering". Be sure to readjust the ion trap after adjusting the picture positioning lever or repositioning the focus coil. Tighten the ion trap mounting screw after adjustment.

The 16GP4, 16TP4 and 19AP4 picture tube use ion trap, part #94A15-2; the 16RP4 picture tube uses ion trap, part #94A15-1. The part number is stamped on the ion trap magnet. The wrong ion trap may cause shaded corners or insufficient brightness.

DEFLECTION YOKE ADJUSTMENT

If picture is tilted, loosen the wing nut "H" on the deflection yoke coil and slightly rotate the yoke coil until picture is straight. Before tightening the wing nut, make sure that the deflection yoke is moved as far forward as possible, otherwise corners of the raster may be shaded. See "Picture Centering".

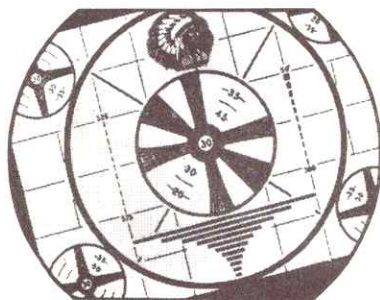


Figure 3. Picture Tilted; Adjust Deflection Yoke Coil.

PICTURE CENTERING

If the picture is off center, it can be centered by using the picture positioning lever, and when necessary, repositioning the focus coil around the picture tube neck. **Note that the picture positioning lever can be moved sideways, or up and down.** Make adjustments very carefully so as not to break neck of tube. **NOTE:** After each adjustment of the picture positioning lever or focus coil, be sure to readjust the ion trap.

When picture is slightly off center, adjust as follows:

- Adjust ion trap as explained under "Ion Trap Adjustment".
- Slightly loosen the screw "A" locking the picture positioning lever to the focus coil; adjust the lever for correct picture centering.
- Readjust ion trap.

When picture is difficult to center, adjust as follows:

- Adjust ion trap as explained under "Ion Trap Adjustment".
- Slightly loosen the two screws "B" holding focus coil to the yoke bracket. Center focus coil around the tube neck; tighten screws. Note: In 19" sets, 3 or 4 fibre spacer shims ($\frac{1}{8}$ " thick) are used under each side of the focus coil mounting bracket (see illustration).
- Loosen the screw "A" and center picture with the picture positioning lever. If the picture cannot be correctly centered with this lever, it may be necessary to adjust the focus coil slightly off center and then make the fine adjustment with the picture positioning lever.
- Readjust the ion trap.

If difficulty is encountered in eliminating shaded corners, adjust as follows:

- Loosen screws "G", then move the yoke support bracket forward until rubber grommet "F" is firmly against the flare of the picture tube. Note: In sets with rectangular picture tube, screws "G" are hex head screws.
- Push the deflection yoke coil "E" as far forward as possible. In some cases, it may be necessary to loosen the two yoke bracket support screws "D" at the sides of the upper mounting bracket, move the bracket up or down, and then move the deflection yoke coil as far forward as possible.
- With some round tubes it may be necessary to rotate the tube in order to find a position in which the picture can be centered without producing shaded corners.
- Shaded corners can also result from use of the wrong ion trap. The 16TP4, 16GP4, and 19AP4 picture tubes use ion trap 94A15-2; the 16RP4 picture tube uses ion trap 94A15-1. The part number is stamped on the ion trap magnet.
- If it is impossible to bring the picture down enough to fill the bottom of the picture window, see "Run 7 in 24D1, 24E1", on page 38 or "Run 9 in 24F1 and Run 10 in 24G1", on page 39.

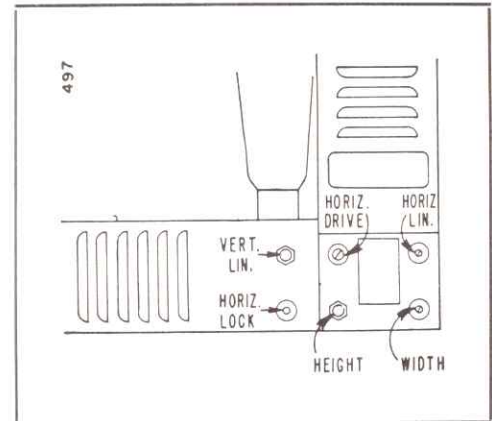
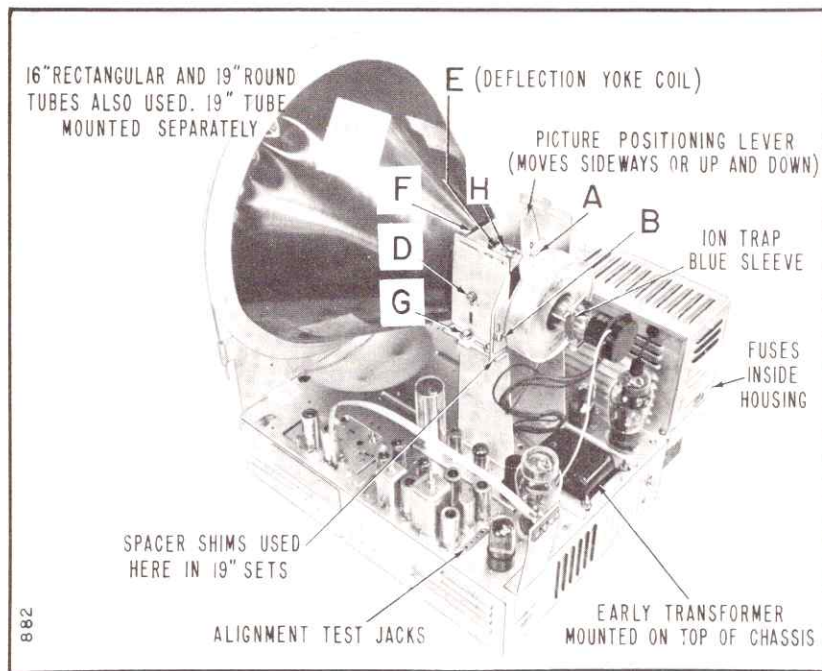


Figure 6. Section of Rear of Chassis, Showing Controls.

Figure 5. Chassis View, Showing Adjustment Locations.

HORIZONTAL DRIVE ADJUSTMENT

The Horizontal Drive adjustment should be made so that the trimmer screw is as far out as possible without causing vertical lines to appear in the picture. Adjust as follows:

- Turn the Channel control to an unused channel.
- Set Brightness control at a lower than average setting.
- Turn the Horizontal Hold control (front panel) completely to the left. (If the Horizontal Hold control is not set at the extreme left position, the vertical lines may be removed in step "d", but may re-appear when the Horizontal Hold is rotated to the right.)
- Turn the Horizontal Drive trimmer screw to the left until one, two or three vertical lines appear near the center of the raster. Then, turn the trimmer screw

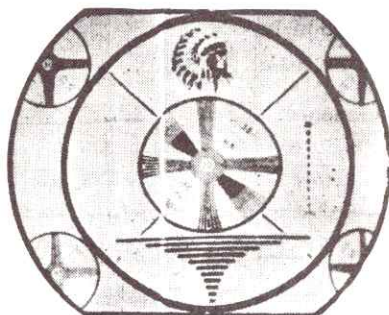


Figure 7. Vertical Line; Adjust HORIZ. DRIVE.

to the right just far enough to make the lines disappear. *If the trimmer screw is turned further than required to eliminate the vertical lines, picture width and brightness may be affected.*

IMPORTANT: Never use the horizontal drive to correct width or linearity. If necessary, make the Width and Horizontal Linearity adjustments.

HORIZONTAL LINEARITY ADJUSTMENT

If the large circle in the center of the test pattern has a cramped or flattened appearance at either side (non-linear horizontally), adjust the Horizontal Linearity control. Note that the Horizontal Drive and the Width controls also affect linearity. Be sure that these controls are set correctly if difficulty is encountered when making the horizontal linearity adjustment.

If vertical lines appear in the center of the picture when adjusting, see "Horizontal Drive Adjustment".

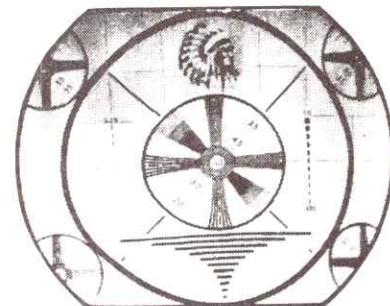


Figure 8. Side of Picture Cramped; Adjust HORIZ. LIN.

WIDTH ADJUSTMENT

If the picture is too wide or too narrow, adjust the Width adjustment screw until the picture just fills the picture tube screen.

If vertical lines appear when adjusting, see "Horizontal Drive Adjustment".

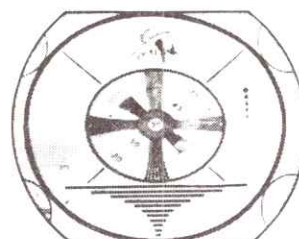


Fig. 9. Too Much Width; Adjust WIDTH.

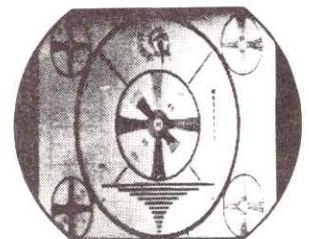


Fig. 10. Not Enough Width; Adjust WIDTH.

HEIGHT and VERTICAL LINEARITY ADJUSTMENT

If the picture is of incorrect height (vertical size), adjust the Height control. This adjustment may affect the vertical linearity of the picture.

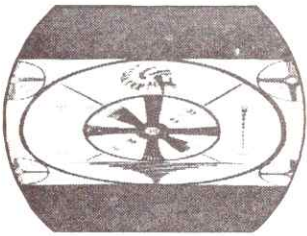
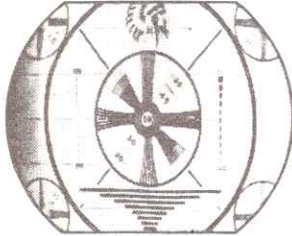


Fig 11. Not Enough Height; Fig 12. Too Much Height; Alternately Adjust HEIGHT and VERT. LIN. Controls.



If the large circle in the test pattern appears cramped or flattened at top or bottom (non-linear vertically), correct by alternately adjusting the VERT. LIN. control and the HEIGHT control.

Note that the upper portion of the picture is affected mostly by the Vertical Linearity control; the lower portion by the Height control.

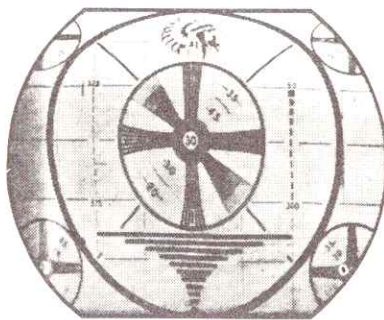


Fig. 13. Top or Bottom of Picture Cramped or Flattened; Adjust VERT. LIN. and HEIGHT.

HORIZONTAL OSCILLATOR ADJUSTMENT

If the picture will not stay in horizontal sync through at least half-rotation of the Horizontal control (on front panel), it will be necessary to make the Horizontal Os-

cillator Adjustment. However, before making this adjustment, be sure that the picture can be made to remain stationary up and down (sync vertically) as lack of both vertical and horizontal sync is an indication of

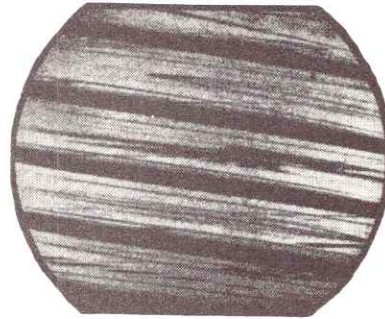


Figure 14. Picture Out of Horizontal Sync.

other trouble such as a defective tube or other component; see Trouble Shooting chart.

Perform this adjustment as follows:

- With television signal properly tuned in, allow the receiver to warm up for a few minutes.
- Rotate the Horizontal control (on front panel) fully to the left. If the picture is not in sync, adjust the Horizontal Lock adjustment until picture falls in sync.
- Very slowly turn the Horizontal Lock adjustment to the left until picture falls out of sync. Now very slowly turn the Horizontal Lock adjustment to the right until the picture just falls in sync.
- Adjustment should now be satisfactory. However, check adjustment by slowly rotating Horizontal control in either direction while interrupting the television signal by switching the channel switch on and off channel. The picture should automatically fall in sync through at least one-half of the range of the Horizontal control. If necessary repeat the above steps.

INTERFERENCE

The operation of certain types of electrical equipment will often interfere with television reception. Some common "interference" patterns are shown in figures 15 to 17. Interference conditions should be considered when the television receiver is first installed and the proper antenna system installed to minimize interference effects. Sometimes a new source of interference will give trouble

after an installation has been made and operating satisfactorily for some time.

RF interference of the type shown in figure 15, can sometimes be removed by re-routing the transmission lead between the antenna terminal and tuner, and/or installing a half wavelength shorting stub as discussed on page 5.

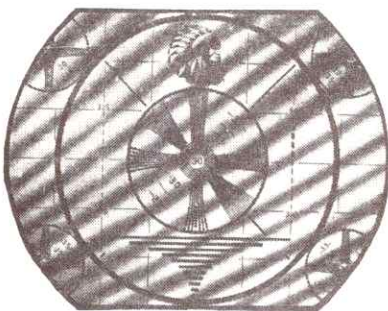


Figure 15. Radio Frequency Interference.

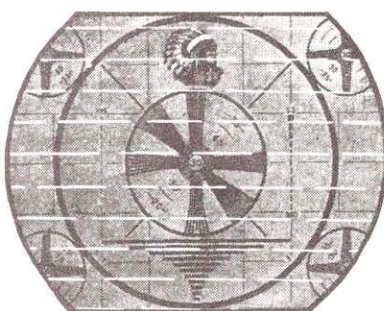


Figure 16. Automobile Ignition Interference.



Figure 17. Interference from Electronic Medical Equipment.

CIRCUIT DESCRIPTION

For Functional Block Diagram, see page 11.

RF TUNER SECTION

RF Amplifier (V101, 6AG5, 6BC5, or 6CB6).

Three different tube types (6AG5, 6BC5, or 6CB6) are used as RF amplifiers. These tubes have similar characteristics and are generally interchangeable. However, it is advisable to check the RF response curve after substitution. Balanced 300 ohm and unbalanced 75 ohm (coaxial line) input impedances are provided by center-tapped primary winding L101A (See schematic). Secondary winding L101B is tuned by V101 input capacity in series with the parallel combination of C101 and C102. Trimmer C102 is used for alignment. Loading of secondary L101B by R101 provides the required bandpass in this first tuned circuit.

Primary coil L102A is part of the plate load of RF amplifier V101. Trimmer C104 and tube output capacity act to tune L102A. Trimmer C104 is a tuner RF adjustment. Damping resistor R103 provides the required bandpass.

Channel selection is accomplished by rotation of the turret assembly, a different set of coils (L101 and L102) being switched in for each channel.

Mixer ($\frac{1}{2}$ V102, 6J6). Secondary coil L102B feeds the RF and oscillator injection voltages to the grid of the mixer stage, one triode section of V102. Secondary L102B is tuned by tube input capacity and trimmer C107. Trimmer C107 is used for RF alignment. Condenser C106, R105 and R106 develop grid-leak bias for the mixer stage. Two resistors are used in this circuit in order that their junction can be brought out as an alignment test point. An oscilloscope can be connected to test point "W" without materially affecting the operation of the circuit.

The output of the mixer stage is coupled to the 1st video IF amplifier (V301) by means of a network composed of C114, L106, C116, L301, L105, and C115. Condenser C116 is a DC blocking condenser. The remainder of the network comprises two tuned circuits and a trap. The plate of the mixer has the tuned circuit L106 and C114 (in series with the trap—L105 and C115) which, with the tube output and distributed capacities, are resonant in the video IF bandpass (22.3MC). The tuned circuit to which this is coupled is composed of L301 and the input capacity of the first Video IF amplifier tube. Over-coupling of these two tuned circuits is provided by the mutual reactance of the trap circuit. Condenser C115 and L105 comprise a trap, tuned to approximately 17.5 megacycles, which performs the function of adjacent channel picture signal rejection.

H. F. Oscillator ($\frac{1}{2}$ V102, 6J6). Oscillator coil L102C is inductively coupled to mixer grid coil L102B for oscillator injection to the mixer. Condenser C109 is in series with the parallel combination of C110 and C111 to form the split-condenser of a Colpitts oscillator. Trimmer C110 is an RF oscillator adjustment. Variable-dielectric type condenser C111 is the Tuning control.

Grid-leak bias for the oscillator is developed by R107 and C108. The oscillator plate is shunt-fed by means of R108.

SOUND SECTION

Sound IF Amplifier (V201, V202, 6AU6). Two high-mu, sharp cut-off pentodes are used as sound IF amplifiers. The first stage is of conventional design, and uses cathode bias. The second stage (V202) is connected as a limiter-amplifier stage. This prevents the development of a high RF voltage by V202 and the production of harmonics of 21.25 MC, which might cause interference of the video signal.

Ratio Detector (V203, 6AL5). A ratio detector is used for FM sound detection. Coupling condenser C209, and volume control R212A make up the AF output load circuit. Resistor R211 and condenser C210 are used as a de-emphasis filter.

Ratio detector limiter action is provided by the filtering action of condenser C208. Condenser C208 is effectively connected across the tuned secondary of T202 through the two diode sections of V203. This tends to hold the IF signal amplitude at its average value, resulting in additional limiter action.

Since C208 charges to a value proportional to average IF signal amplitude and then limits at that level, the circuit will adjust itself to any signal level. As a result, limiter action is effective on weak as well as strong signals.

Audio Amplifiers (V204, 6SQ7GT, or 6AU6). A triode amplifier (6SQ7) is used in early sets. A miniature pentode amplifier (6AU6) is used in later sets. (Sets with rectangular picture tubes use the 6AU6 only.) Both circuits are of conventional design.

Audio Output (V205, 6V6GT). A 6V6GT tube is used as a single ended power amplifier. This stage, together with the audio amplifier, provides the necessary audio power to drive the speaker. It is well to remember that the greater portion of the current through focus coil L306 is also drawn through the audio output tube. A defective audio output tube might result in improper focus.

VIDEO SECTION

Video IF Amplifiers (V301 and V302, 6AU6 and V303, 6AG5). Three stages of transformer coupled, stagger-tuned, video IF amplification are used. These stages, and the audio IF system, are mounted on a separate sub-chassis. The slug-tuned IF transformers used for inter-stage coupling are bifilar-wound (close coupled) types in order to get maximum gain without a sacrifice in bandwidth.

The video system includes three sound traps, resulting in better sound IF carrier rejection and intercarrier beat rejection. Since this is very effective in removing

sound bars from the picture, the Tuning control adjustment is less critical. One trap (L201 and C201) is series resonant at 21.25 megacycles and is coupled to the first video IF transformer (T301) by a low impedance link. This trap also serves as the sound IF take-off (the voltage across C201 is fed to the grid of V201, the first sound IF amplifier). A second 21.25 megacycle trap (T303 and C303) provides sound carrier rejection by introducing degeneration at 21.25 megacycles in the cathode circuit of 3rd video IF amplifier V303. A third trap (L303 and C307) is slug-tuned to parallel resonance at 4.5 megacycles and comprises part of the video detector load. This trap offers a high impedance to the 4.5 megacycle inter-carrier beat appearing at the detector and prevents it from being passed on to the video amplifier grid.

Automatic gain control bias developed across R434 is supplied to the control grids of V101, V301 and V302 through RC decoupling networks.

Video Detector (½ V304, 6AL5). Series peaking in the video detector load is accomplished by L302 in order to obtain a flat response over the entire video frequency range. Condenser C306 is the usual IF bypass and removes the video IF carrier from the detected video signal. The detector output is direct-coupled (DC coupled) to video amplifier V306 (6AC7).

Automatic Gain Control (V305, 6AU6). A gated pentode circuit provides automatic gain control bias for the grids of the RF and first two Video IF Amplifiers based on the transmitted sync pulse level. The grid of this tube is supplied with the composite video signal voltage from the output of video amplifier V306. Pulsed plate voltage, developed during retrace time, taken from the width control winding on T404 is fed through C428 to the plate of AGC tube V305. Due to this pulsed plate supply, AGC tube V305 conducts only during the horizontal sync pulse interval (retrace time). Since the magnitude of plate current conduction during this interval is determined by the transmitted sync pulse level, the transmitted sync pulse level then determines the AGC voltage developed by AGC tube V305.

The transmitted sync pulse level is used to determine the amount of AGC bias developed, since this is a con-

stant level with respect to the transmitted carrier (representing 100 percent carrier power). If the composite video signal were used to determine the amount of AGC bias, the AGC voltage would vary with changes in the average picture brightness (background illumination) being transmitted.

The output load circuit for AGC tube V305 consists of R434, R435, R436 and R437. AGC filtering is provided by R436, R437, C426 and C427. Rectification of V305 AC plate voltage (supplied from the width control winding on T404), is accomplished by connecting the plate circuit of V305 in parallel with the AGC output load and filter circuit. (This arrangement resembles the parallel connection of a DC restorer type of rectifier rather than the usual series type of rectifier used for AM detectors or power supply circuits. However, its operation is effectively the same.)

Due to frequency selectivity characteristics of antenna systems and transmitter operating conditions sometimes encountered at a given installation, the sync pulse level during the vertical blanking period may not be the same as that during the remainder of the vertical trace interval. This would cause a "bump" in the AGC voltage which occurs at a sixty cycle-per-second (vertical blanking) rate. Since AGC voltage is used on stages common to the audio section of the receiver, this may result in excessive amplitude modulation of the audio IF carrier. If this modulation is of sufficient amplitude, the ratio detector will be unable to completely reject it. An audio "buzz" will result. An AGC filter consisting of R438 and C429 is connected from the AGC plate to ground in order to remove the "bump" from the AGC voltage. This eliminates the audio "buzz" that might otherwise result due to the above operating conditions.

Video Amplifier (V306, 6AC7). The video amplifier is a pentode voltage amplifier with a constant K filter (L304, R319, L305, R320 and R318) for a plate load. Picture control R325 varies the gain of video amplifier V306 by adjusting the screen voltage applied to the tube. An increase in video amplifier screen voltage decreases the DC plate resistance of the tube (as well as increasing its gain). The voltage developed across plate load resistor R318 then increases. Since the control grid of AGC tube V305 is connected to junction of L305, R320, and R318, the bias voltage applied to the control grid of the AGC tube becomes more negative (with respect to cathode). The AGC tube plate current decreases and results in less AGC voltage. This reduction in AGC voltage increases the gain of the RF and first two video IF amplifier stages. Picture control thus results in direct adjustment of video amplifier gain and indirect adjustment of RF and video IF amplifier gain.

Since the output of the video amplifier is of negative picture phase, it must be coupled to the cathode of the picture tube (rather than the grid). AC video signal coupling between the video amplifier plate circuit and the cathode of the picture tube is provided by condenser C311. Resistor R321 is used for DC coupling and is ef-

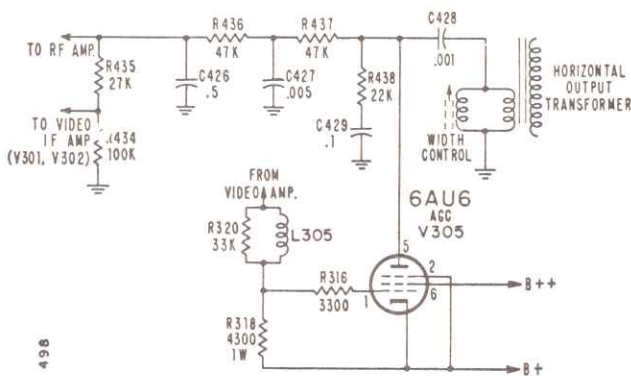


Figure 18. Automatic Gain Control (AGC) Circuit.

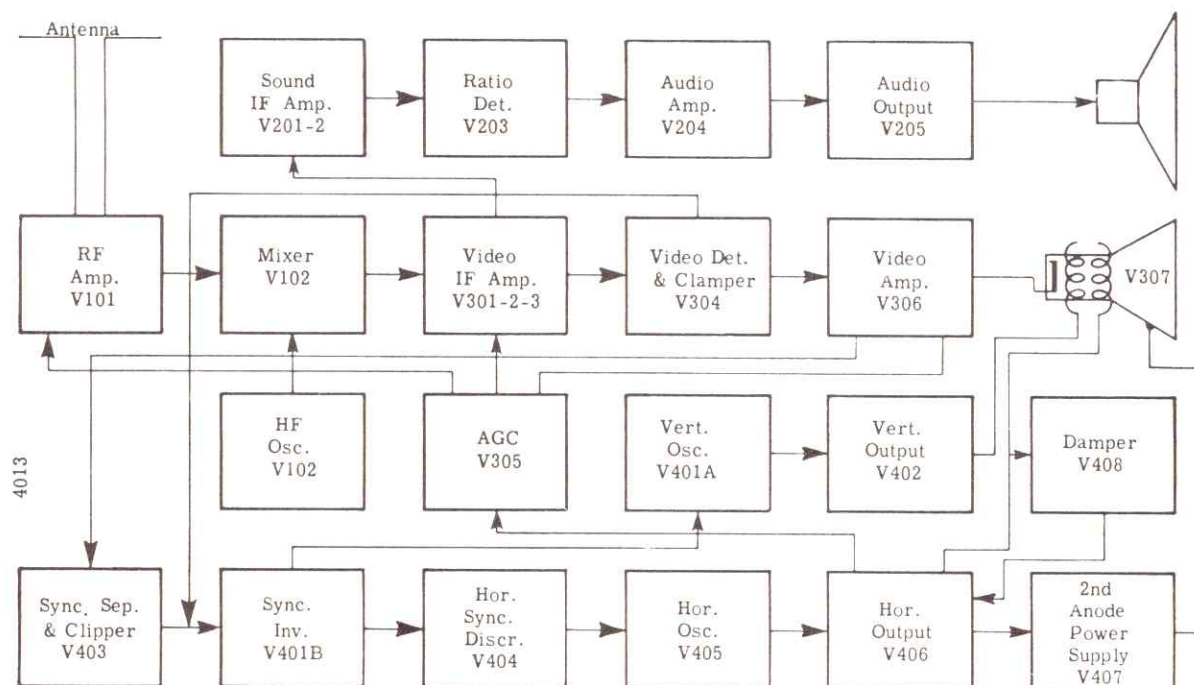


Figure 19. Functional Block Diagram.

fectively connected in series with the input resistance of the picture tube. Since the picture tube input resistance is quite high (approximately one megohm) with respect to R321 (220K), only 20 percent (or slightly less) of the DC level is lost. Since 80 percent DC level is quite adequate under normal operating conditions, the circuit provides effective DC coupling.

SWEEP AND SYNC SECTION

Sync Separator and Clipper (V403, 12AU7). One-half of a miniature type dual triode tube is used to separate the sync signal from the composite video signal. The second triode section is used to clip the noise from the peaks of the sync pulses. This stage also provides some sync pulse amplification.

Clamper ($\frac{1}{2}$ V304, 6AL5). The second half of V304 (6AL5) is used to maintain a constant sync pulse level at the input to sync inverter V401B. This circuit functions in a similar manner to a diode DC restorer.

Sync Inverter (V401B, $\frac{1}{2}$ 6SN7GT). One-half of a dual triode serves as a phase inverter to provide balanced, push-pull drive to the horizontal sync discriminator. Push-pull output is achieved by splitting the plate load (R422 and R423) of V401B between the cathode return and plate circuits.

Horizontal Sync Discriminator (V404, 6AL5). Balanced sync pulse voltage from the sync inverter is supplied through an RC coupling network to the sync discriminator. A reference voltage from the horizontal output circuit is fed from the width control winding on T404, through an RC network made up of R428 and C415, to the junction of pins 5 and 7 of V404.

The discriminator develops a DC voltage across R426 that is proportional to the phase difference between the transmitted sync pulse voltage and the horizontal sweep reference voltage. When the frequency and phase relationship between these two voltages is correct, the sync discriminator supplies normal operating bias to the first triode section of horizontal oscillator V405 (6SN7). When a change in the phase or frequency relationship between the transmitted sync pulse voltage and the horizontal sweep reference voltage occurs, the DC output voltage across R426 changes accordingly. This change in DC bias on one section of the horizontal oscillator makes the necessary phase or frequency correction.

The horizontal sync discriminator output (across R426) is applied to the grid of one triode section of the horizontal oscillator through a filter (R427, C414 and C417) which removes any noise or sync pulse voltage.

Horizontal Oscillator (V405, 6SN7GT). A dual triode combines the two functions of horizontal oscillator and control tube within one envelope. The circuit is that of a modified multivibrator. Frequency of oscillation is largely controlled by L401, C416, C419, R431 and R432. Slug adjustment of L401 serves as the horizontal lock control while R432 is a vernier frequency adjustment and serves as a horizontal hold control. The circuit differs from the conventional multivibrator in that the grid of the first triode section is isolated for control purposes. Feedback between the triode sections is through common cathode resistor R430 and C419.

The DC output voltage of the horizontal sync discriminator supplies a bias voltage which is added to the normal operating bias of the first triode section of V405 provided by the drop across cathode resistor R430. The frequency of oscillation is determined not only by L401,

C416, C419, R431 and R432, but is also affected by the plate resistance of the first triode section of V405. The plate resistance, in turn, is determined by the bias applied to the control grid (pin 1 of V405). A shift in phase or frequency between the transmitted sync pulse and the horizontal sweep reference voltage produces a change in the output voltage of the sync discriminator. This change in voltage is applied to pin 1 (grid) of horizontal oscillator V405 and results in the required phase or frequency correction.

Horizontal Output (V406, 6CD6G). A beam pentode in the horizontal output circuit has the dual function of providing driving power for the horizontal deflection coils and a high potential pulse for second anode rectifier V407 (1B3GT). A special high voltage, high current tube must be used to meet the power requirements in this circuit.

The output of the horizontal amplifier is transformer-coupled to T403B, the horizontal deflection coils. A high efficiency "ceramic iron" core is used in both the deflection yoke and horizontal output transformer in order to obtain the required sweep needed in 70 degree deflection (short neck) tubes, and to supply the required 2nd anode voltage (approx. 13 KV) for adequate picture brightness.

L403 is shunted across a secondary winding on horizontal output transformer T404 and, by means of a slug adjustment, functions as a width control by varying the load impedance reflected into the plate circuit of horizontal output tube V406. This same secondary on T404 also supplies the pulsed plate voltage to AGC tube V305.

Second Anode Supply (V407, 1B3GT). Pulsed voltage developed by horizontal output amplifier V406 is stepped up by the auto-transformer type primary of horizontal output transformer T404. Approximately 13,000 volts is obtained in this manner due to the high efficiency of the horizontal output tube (6CD6) and the low-loss "ceramic iron" core of transformer T404.

A 1B3GT is connected as a conventional half-wave rectifier with its filament power supplied by a separate secondary winding on T404. Due to the light loading and relatively high frequency voltage source, an RC filter (R445 and C435) provides adequate filtering for the second anode supply.

Damper (V408, 6W4GT). The damper is connected in a manner which provides an effective increase in plate supply voltage to horizontal output amplifier V406. The plate current of V406 flows through damper tube V408 for the major portion of the horizontal trace. Condensers C432, C433 and C434 charge during this period and supply current to V406 during the time that V408 is not conducting. The average voltage developed due to plate current flow through V408 is equal to the plate supply source voltage plus the positive peaks of the horizontal sweep voltage in the horizontal output circuit. (This is true since these voltages are added together and applied

to the plate of damper tube V408.) The use of the damper tube in a "boot strap" circuit of this type provides a plate supply source for the horizontal output tube that is approximately 150 volts higher than that normally available from the power supply rectifier and filter system. This high voltage supply appears at the junction of C434, L402 and the primary winding of T404.

The boot strap filter (C432, C433, C434 and L402) provides linearity control by adjusting the cathode waveform (bias) of the damper tube in addition to filtering the boot strap supply voltage. Linearity is adjusted by a slug in L402.

Plate current flow through V408 also results in the damping action required to prevent transient oscillations from developing in the horizontal deflection coils immediately following the retrace interval. The damper tube is used for developing a boot strap voltage and for linearity control as well as damping action.

Vertical Oscillator (V401A, 1/2 6SN7GT). Synchronizing pulses are fed from the cathode of sync inverter V401B, through an integrating network (R401, R402, R403, C401, C402 and C403), to the grid of blocking oscillator V401A (1/2 6SN7). Vertical hold is provided by potentiometer R405 which changes the RC time constant in the grid circuit of V401A. Height control is provided by varying the plate voltage on V401A by potentiometer R409. Plate voltage changes caused by height control adjustment are prevented from affecting the vertical oscillator frequency by means of a DC correction voltage applied to the grid of V401A through a divider network composed of R406 and R407. Condenser C406 and resistor R410 comprise a waveforming network.

Vertical Output (V402, 6S4). A miniature triode tube, designed to operate at high plate voltages and currents, is used as the vertical output amplifier. It is auto-transformer coupled to vertical deflection coils T403A by means of T402. Resistors R414 and R415 act as damping resistors to prevent transient oscillations in the deflection coil circuit. R412 provides vertical linearity control by varying the cathode bias on V402.

POWER SUPPLY SECTION

Transformer T501, with a high voltage winding and three heater windings, supplies AC power to both the high and low voltage rectifiers. The high voltage winding is tapped to furnish low voltage to the plates of low voltage rectifier V502.

One 6.3 volt heater winding is used to supply heater voltage to low voltage rectifier V502 (6AX5) and damper tube V408 (6W4). Since excessive heater-to-cathode voltage would be applied to V408 with this heater winding grounded, it is tied to the low voltage power supply circuit through R502. The 5U4G high voltage rectifier (V501) uses a separate 5 volt filament winding. The remainder of the heaters in the chassis receive their heater voltage from a common 6.3 volt winding.

Low Voltage Supply (V502, 6AX5). A full wave rectifier and pi-type RC filter supplies B plus voltage to the tuner, sync separator V403, and the video section. Heater power for the 6AX5 (and 6W4 damper) is supplied by a separate heater winding in order that the 6AX5 (and 6W4) can be operated well within its operating voltage ratings.

An RC type filter is used in this supply in order to protect the video amplifier (V306) by dropping the supply voltage when the tube loses its bias under no-signal conditions.

High Voltage Supply (V501, 5U4G). The audio section, vertical oscillator V401A, vertical output V402, horizontal oscillator V405, sync inverter V401B, and horizontal output V406 are supplied with B plus voltage by a full-wave rectifier and pi-type LC filter.

Audio section plate current is used for focusing the picture tube. This current is relatively constant since no AGC voltage is applied to these stages.

SWITCHING IN COMBINATION MODELS

The AC power switches on the Off-Volume controls for the television receiver and the radio are connected in parallel. Either one will turn on the common power supply. The AC power switch on each Off-Volume control has a separate set of contacts that open when the AC power switch contacts close. This extra set of contacts on the radio completes the TV heater string when the radio is turned off. The extra set of contacts on the television Off-Volume switch completes the radio heater string when the TV set is turned off. If both switches are turned on, neither unit will operate.

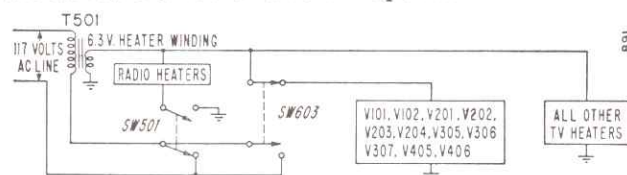


Figure 20. Heater Switching in Combination Models.

TELEVISION ALIGNMENT PROCEDURE

GENERAL

Complete alignment consists of the following individual procedures. Complete alignment should be performed in this sequence.

- IF Amplifier and Trap Alignment (Video & Sound).
- RF and Mixer Alignment.
- High Frequency Oscillator Alignment.
- Overall RF and Video IF Response Curve Check.

HIGH VOLTAGE WARNING

High voltages are present throughout this receiver. Operation of the set outside of the cabinet or with the cabinet back removed involves shock hazard. Exercise normal high voltage precautions.

Caution: The metal cone on 16" and 19" round picture tubes operates at 13,000 volts. To avoid accidental contact with this high voltage when working near picture tube, it is advisable to remove cap from the 1B3GT tube and insulate it from the chassis. Then discharge the electrostatic charge on the cone to the chassis with an insulated screwdriver.

Very carefully follow instructions given in this manual regarding location of test points for alignment, for taking voltage measurements, or in making oscilloscope waveform analysis. Do not connect test equipment across other points in the receiver unless you are thoroughly familiar with the circuit wiring and points at which high voltages are present.

TEST EQUIPMENT

To properly service this receiver, it is recommended that the following test equipment be available.

IMPORTANT: Many service instruments do not meet the requirements given below. A list of recommended equipment is available from Admiral distributors.

Oscilloscope

Standard oscilloscope, preferably one with a wide band vertical deflection, vertical sensitivity at least .5 volt (RMS) per inch.

Signal Generator

4.5 MC frequency.

18 to 30 MC frequency range.

50 to 90 MC frequency range.

170 to 225 MC frequency range.

Must have a built-in calibration crystal for checking dial accuracy.

Sweep Generator

Sweep generator must provide sweep frequencies from

18 to 30 MC range:	} with at least 10 MC sweep width.
50 to 90 MC range:	
170 to 225 MC range:	

Output: adjustable; at least one-tenth volt maximum.

Output impedance: 300 ohms balanced to ground.

A sweep generator not having constant output voltage over the swept range and linear sweep, will produce curves which are widely different from the ideal curves shown in the following pages. If repeated difficulty is encountered in obtaining these curves, the sweep generator should be checked. A simple check is to observe the response curve for a set that is in alignment.

Before suspecting the generator, be sure the alignment instructions in this manual have been followed carefully.

Vacuum-Tube Voltmeter

Vacuum-tube voltmeter with a detector probe having 4.5 MC response (vacuum tube or germanium crystal probe). Preferably VTVM with low range (3 volt) DC zero center scale and a high voltage probe (30,000 volt range).

ALIGNMENT TOOLS

An alignment tool kit consisting of one metallic and one non-metallic screwdriver is available under part number 98A30-3. A non-metallic alignment tool with a screwdriver point at one end and hexagonal wrench (for hollow hexagonal core slugs) at the other is available under part number 98A30-7.

Adj.	Symbol	Frequency	Function	Adj.	Symbol	Frequency	Function
A1	L201	21.25 MC	1st Sound Trap	A8	T304	23.5 MC	3rd Video IF Transformer
A2	T303	21.25 MC	2nd Sound Trap	A9	T301	22.0 MC	1st Video IF Transformer
A3	T201	21.25 MC	Primary, 1st Sound IF Transformer	A10	L106	22.3 MC	Mixer Plate Coil
A4	T201	21.25 MC	Secondary, 1st Sound IF Transformer	A11	L303	4.5 MC	4.5 MC Beat Trap
A5	T202	21.25 MC	Primary of Ratio Detector Transformer	A12	C102		RF Input Trimmer
A6	T202	21.25 MC	Secondary of Ratio Detector Transformer	A13	C104		RF Output Trimmer
A7	T302	25.3 MC	2nd Video IF Transformer	A14	C107		Mixer Trimmer
				A15	C110		HF Oscillator Trimmer
				A16	L102		Slug, HF Oscillator Coils
				A17	L310	19.75 MC	Adjacent Channel Trap
				A18	L309	27.25 MC	Adjacent Channel Trap

IF AMPLIFIER AND TRAP ALIGNMENT

- To service TV chassis with radio disconnected, complete the heater circuit by connecting a jumper wire from pin "L" to "K" of socket M504. See schematic.
- Connect a 4½ volt battery; negative to AGC buss (junction of R435, C426 and R436), positive to chassis. Leave connected for all steps in this alignment.
- Disconnect antenna. Connect jumper wire across terminals.
- Set Channel knob to 13 or other unassigned high channel (to prevent interference during alignment).
- Set Picture control at half rotation.
- Allow about 15 minutes for receiver and test equipment to warm up.
- The IF sub-chassis cover should be securely tightened to the IF sub-chassis for all alignment steps.
- Use VTVM on lowest scale (3 volts). RF detector probe used in step 8, must cover 4.5 MC.

Step	Signal Gen. Frequency (MC)	VTVM and Sig. Gen. Connections	Instructions	Adjust
1	*21.25	VTVM high side to test jack "X"; common to chassis. Generator high side to 1st Video IF grid (pin 1 of V301) through a .01 condenser at lead of L301. Connect generator low side to chassis near V301.	Use lowest signal generator output for adequate meter indication, then gradually increase generator output as VTVM reading decreases. Use VTVM DC range.	A1 and A2 for minimum.
2	Late sets have adjacent channel traps L309 (27.25 MC) and L310 (19.75 MC) mounted under chassis near TV tuner. (See discussion and illustration on page 39.) If set does not have traps, proceed with step 4.			
	*19.75	VTVM high side to test jack "X"; common to chassis. Connect generator high side to 6J6 (V102) tube shield; insulate shield from chassis. Connect low side to chassis near 6J6 tube base.	Use lowest signal generator output for adequate meter indication, then gradually increase generator output as VTVM reading decreases. Use VTVM DC range.	A17 for minimum.
3	*27.25			A18 for minimum. Repeat step 2.
4	*21.25	VTVM high side to test jack "V"; common to chassis. Connect generator high side to 6J6 (V102) tube shield; insulate shield from chassis. Connect low side to chassis near 6J6 tube base.	While peaking, keep reducing signal generator output so VTVM reading is approx. +1.5 volts DC.	A3, A4, and A5 for maximum.
5	*21.25	VTVM high side to test jack "Z"; common to test jack "V". Connect generator as in step 4.	Use 3 volt zero center DC scale if available.	A6 for zero between pos. and neg. peak. If far off readjust A5.
	**25.3			**A7 for maximum.
	23.5	VTVM high side to test jack "X", common to chassis. Connect generator as in step 4.	While peaking, keep reducing signal generator output so VTVM reading is approx. -1 volt DC.	A8 for maximum.
8	22.0			A9 for maximum. If off, repeat A1.
9	22.3			A10 for maximum.
10	*4.5 unmodulated or AM modulated.	RF detector probe of VTVM (thru a .01 mfd. condenser) to plate of video amplifier, pin 8 of V306 (6AC7); common to chassis. Caution: Voltage at pin 8 is 130 volts. Connect generator high side to test jack "S"; low side to chassis.	The frequency range of the RF detector probe must cover 4.5 MC. Generator output should be at least .1 volt.	A11 for minimum.
11	To insure correct IF alignment, make the "Video IF Alignment Check" and "Sound IF Alignment Check" as given on pages 15 and 16.			

* Before proceeding, be sure to check the signal generator used in alignment against a crystal calibrator or other frequency standard for absolute frequency calibration required for this operation.

** Stage may break into oscillation if slug is turned in too far. Oscillation indicated by sudden increase in VTVM reading.

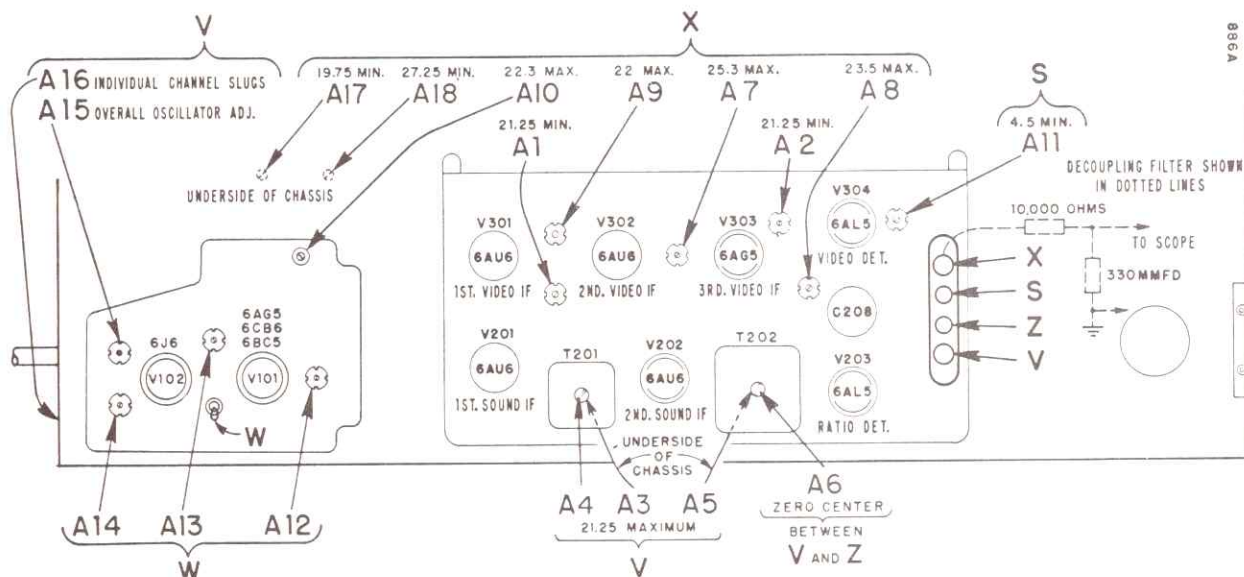


Figure 21. Top View of Chassis Showing Alignment Adjustment Locations.

VIDEO IF ALIGNMENT CHECK

(Using sweep generator and oscilloscope with sweep input to mixer)

If the "IF Amplifier and Trap Alignment" has been made correctly, the three stagger-tuned video IF stages should produce the Video IF response curve shown.

However, due to differences in tube gain and component values, it is advisable to view the video IF response curve before proceeding with "RF and Mixer Alignment" and "Overall RF and Video IF Response Curve Check". Proceed as follows:

- a. Make all control settings and connections as given in the heading of the IF Amplifier and Trap alignment chart. Disconnect signal generator and VTVM (if used in previous alignment).
- b. Connect oscilloscope between test jack "X" and chassis ground through a decoupling filter (figure 21). Keep leads away from receiver.
- c. Connect sweep generator high side to tube shield of 6J6 mixer tube. Be sure to insulate tube shield from chassis. Connect sweep generator low side to chassis close to 6J6 tube base. Set sweep generator at center of IF band pass (24 MC) and sweep the video IF bandpass with a 10 MC sweep.
- d. If sweep generator does not have a built-in marker generator, loosely couple marker generator high side to the sweep generator lead connected to tube shield on tuner; low side to chassis ground.

Important

To avoid distortion of the response curve, keep the sweep generator and marker generator outputs at a very minimum when following the steps below. Marker pips should be kept just barely visible. To minimize distortion, set the sweep generator output for VTVM reading from .5 to 1 volt DC between test jack "X" and chassis.

- e. Compare the curve obtained with figure 22.

Check sound IF marker (21.25 MC) and video IF marker (25.75 MC) points. It is important that marker pips be in proper location on the response curve. Consistent with proper band width and correct

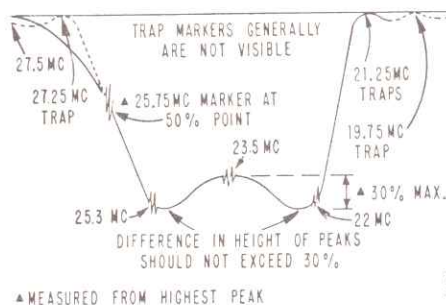


Figure 22. Video IF Response Curve. Portion of curve in broken line applies only to sets having adjacent channel traps (19.75 MC and 27.25 MC).

location of markers, the response curve should have maximum amplitude and flat top appearance, and peaks with approximately equal amplitudes as shown in the illustration.

If necessary to adjust for peaks with approximately equal amplitude, carefully adjust IF slug A8 (23.5 MC coil) while observing the response curve. It should not be necessary to turn slug A8 more than one turn in either direction.

If 25.75 MC marker does not locate reasonably close to the 50% point on the slope of the response curve, carefully adjust A7 (25.3 MC coil) not more than one turn in either direction until correct results are obtained.

If necessary, all three adjustments, A7, A8, and A9 can be slightly touched up to obtain correct curve. Note that adjusting A8 will vary the placement of the dip in the center of the curve, A9 will vary the 22 MC peak, and A 7 will vary the 25.3 MC peak.

- f. If the curve cannot be made to resemble the response curve shown, repeat steps 1, 2, 3, 6, 7, 8 and 9 under "IF Amplifier and Trap Alignment" making sure that generator frequencies are precise and adjustments are accurately made. If a satisfactory curve cannot be obtained after repeating these steps, it may be necessary to change IF amplifier tubes or check for a defective circuit component to be sure that each stage is operating properly.

SOUND IF ALIGNMENT CHECK

(Using sweep generator and oscilloscope)

- Disconnect signal generator and VTVM (if used in previous alignment).
- Connect oscilloscope between test jack "Z" and chassis ground through a decoupling filter (figure 21). Keep leads away from receiver.
- Connect sweep generator high side to a tube shield placed over 1st Video IF tube V301 (6AU6), low side to chassis ground. Set sweep generator to sweep the sound IF bandpass (20.25 to 22.25 MC).
- If sweep generator does not have a built-in marker generator, loosely couple marker generator high side to the sweep generator high side, low side to chassis.

Important

To avoid distortion of the response curve, keep the sweep generator and marker generator outputs at a very minimum. Marker pips should be kept just barely visible.

- Observe ratio detector response curve. Since the

sweep signal is fed through the entire sound IF system for this check, mis-alignment of the sound IF's will affect this curve. This provides an overall sound IF response check. The slope of the curve should be straight for at least 50 KC on either side of the 21.25 MC marker. Maximum size and linearity of the straight portion of the curve is ideal. Note that the ratio detector circuit used gives a symmetrical "S" pattern. Check for linearity between the markers indicated on the curve.

- If correct curve is not obtained, repeat steps 4 and 5 of "IF Amplifier and Trap Alignment". Recheck curve.

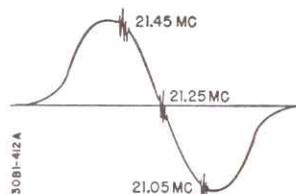


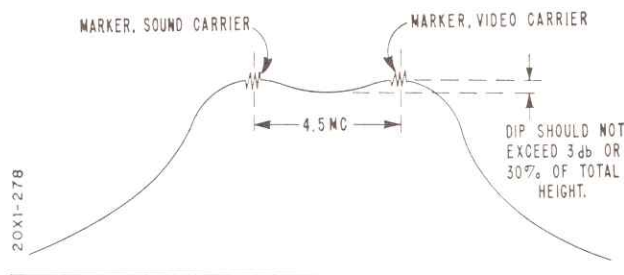
Figure 23. Ratio Detector Response Curve.

RF AND MIXER ALIGNMENT

- To service TV chassis with radio disconnected, complete the heater circuit by connecting a jumper from pin "L" to "K" of socket M504. See schematic.
- Disconnect 4½ volt battery, if used earlier.
- Connect a wire jumper from AGC buss (junction of R435, C426, R436) to chassis. Leave connected for all steps in this alignment.
- Disconnect antenna from receiver.
- Connect sweep generator to antenna terminals.

- If sweep generator does not have a built-in marker generator, loosely couple marker generator to antenna terminal (to obtain marker pips of video and sound RF carriers). To avoid distortion of the response curve, keep marker and sweep generator outputs at a minimum, marker pips just barely visible.
- Connect oscilloscope through 10,000 ohm resistor to point "W". Keep oscilloscope leads away from chassis.
- Before starting alignment, allow about 15 minutes for receiver and test equipment to warm up.

Step	Marker Gen. Freq. (MC)	Sweep Gen. Frequency	Adjust
1	*205.25 **209.75	Sweeping Channel 12	Check for curve resembling RF response curve shown below. If necessary, adjust A12, A13, and A14 as required. Consistent with proper band width and correct marker location, response curve should have maximum amplitude and flat top appearance.
2	211.25 215.75	13	Check each channel for curve resembling RF response curve shown below. In general, the adjustment performed in step 1 is sufficient to give satisfactory response curves on all channels. However, if reasonable alignment is not obtained on a particular channel, (a) check to see that coils have not been intermixed, or (b) try replacing the pair of coils for that particular channel, or (c) repeat the adjustment given in step 1 for the weak channel as a compromise adjustment to favor this particular channel. If a compromise adjustment is made, other channels should be checked to make certain that they have not been appreciably affected.
3	199.25 203.75	11	
4	193.25 197.75	10	
5	187.25 191.75	9	
6	181.25 185.75	8	
7	175.25 179.75	7	
8	83.25 87.75	6	
9	77.25 81.75	5	
10	67.25 71.75	4	
11	61.25 65.75	3	
12	55.25 59.75	2	



Full skirt of curve will not be visible unless generator sweep width extends beyond 10 MC.

Figure 24. RF Response Curve.

* Video Carrier Frequency (MC)

** Sound Carrier Frequency (MC)

HF OSCILLATOR ADJUSTMENT

(Using a signal generator)

It is always advisable to make individual channel slug (oscillator) adjustment using a television signal as instructed on page 5. If a television signal is not available, oscillator adjustment can be made using a crystal calibrated signal generator. Note that adjustment "A15" (figure 25) is an overall oscillator adjustment and should only be made when the mixer-oscillator tube is replaced. Generally "A15" adjusts with about 3/16" of screw thread exposed. Make adjustments as instructed below.

INDIVIDUAL CHANNEL OSCILLATOR ADJUSTMENTS USING SIGNAL GENERATOR & VTVM

- Allow about 15 minutes for receiver and test equipment to warm up. Disconnect antenna from receiver.
- Connect signal generator high side to one antenna terminal, low side to chassis.
- See Figure 21. Connect VTVM high side to test jack "Z"; common to test jack "V". Use VTVM 3 volt zero center scale if available.
- Set Tuning control at half rotation by rotating it approximately 150° as shown in the tuner illustration. Note position of tuning rotor.
- *Using a NON-METALLIC alignment tool, with a 1/8 inch blade, adjust as follows:

Channel	Generator Freq. (MC)	Adjust
13	215.75	*Adjust A16 for zero VTVM reading between a positive and a negative peak with Tuning control at half rotation. Do this carefully as only a slight rotation of slug may be required. Note that if a major number of channels are all the way in or all the way out in the same direction, an overall HF oscillator adjustment (A15) should be made.
12	209.75	
11	203.75	
10	197.75	
9	191.75	
8	185.75	
7	179.75	
6	87.75	
5	81.75	
4	71.75	
3	65.75	
2	59.75	

OVER-ALL OSCILLATOR ADJUSTMENT (A15)

Over-all oscillator adjustment should only be necessary when replacing the oscillator-mixer tube (6J6), or when all channel slugs are off in the same direction. When replacing the oscillator-mixer tube (6J6), it is recommended that several tubes be tried to select one which will cause least oscillator frequency shift.

A15 is generally adjusted so that approximately 3/16" of screw thread is exposed.

This overall adjustment can be made with or without test equipment as follows:

* When Using A Signal Generator and VTVM

- Allow about 15 minutes for receiver and test equipment to warm up. Disconnect antenna from receiver.
- Connect signal generator high side to one antenna terminal, ground to chassis.
- See figure 21. Connect VTVM high side to test jack "Z"; common to test jack "V". Use VTVM 3 volt zero center scale if available.
- Set Tuning control at half rotation by rotating it approximately 150° as shown in the tuner illustration. Note position of tuning rotor.
- Set receiver to channel 13 or other unused high channel.
- Carefully adjust A15 for zero VTVM reading between a positive and negative peak.
- Check all channels for zero reading at center of Tuning control range. If all channels do not zero at center of range, touch-up the channel slugs (A16).

* When Using A Television Signal

- Set the Channel knob for a high channel station; adjust controls for normal picture and sound.
- Set Tuning control at electrical center by rotating approximately 150° or half rotation as shown in the tuner illustration. Note position of tuning rotor.
- Carefully adjust A15 for best sound.
- Check all channels for best sound at center of Tuning control range. If best sound is not obtained at center of range, touch-up the channel slugs A16 as required.

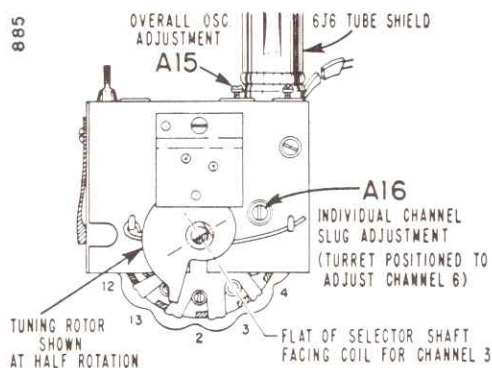


Figure 25. Front View of Tuner.

* If the sound IF amplifiers are not correctly aligned, the HF oscillator cannot be aligned accurately. It may be necessary to make the sound IF amplifier alignment (steps 4 and 5 under "IF Amplifier and Trap Alignment") before proceeding.

OVERALL RF and VIDEO IF RESPONSE CURVE CHECK

(Using sweep generator and oscilloscope with sweep input to antenna terminals)

1. Make all control settings and connections as given in the heading of the IF Amplifier and Trap alignment chart. Disconnect signal generator and VTVM (if used in previous alignment).
2. Connect a 4½ volt battery; negative to AGC buss (junction of R436, C426 and R435), positive to chassis.
3. Connect oscilloscope between test jack "X" and chassis ground through a decoupling filter (figure 21). Keep leads away from receiver.
4. Connect sweep generator to antenna terminals.
5. Connect marker generator high side to point "W" on tuner through a 10,000 ohm resistor. Connect low side of marker generator to chassis.
6. Sweeping the RF band pass for an unassigned high channel (see frequencies in "RF and Mixer Alignment"), check the response curve obtained against the ideal response curve shown.

Important: To avoid distortion of the response curve, keep the sweep generator and marker generator outputs at a very minimum. Marker pips should be kept just barely visible. Setting sweep generator output for VTVM reading from .5 to 1 volt DC (measured between point "X" and chassis, will avoid distortion of response curve.

Consistent with proper band width and correct location of markers, the response curve should have maximum amplitude and flat top appearance, and peaks with approximately equal amplitudes as shown in the illustration.

If necessary to adjust for peaks with approximately equal amplitude, carefully adjust IF slug A8 (23.5 MC coil). It should not be necessary to turn slug A8 more than one turn in either direction.

Rotation of the Tuning control (on the receiver) will move the markers up or down on the response curve. Set the Tuning control so that the video IF marker (25.75 MC) appears at or reasonably close to the 50% point on the curve with all other markers (especially traps) appearing at the proper points. If other markers cannot be made to appear at proper points when the video IF marker (25.75 MC) is reasonably close to the 50% point, repeat the "IF Amplifier and Trap Alignment" and the "Video IF Alignment Check".

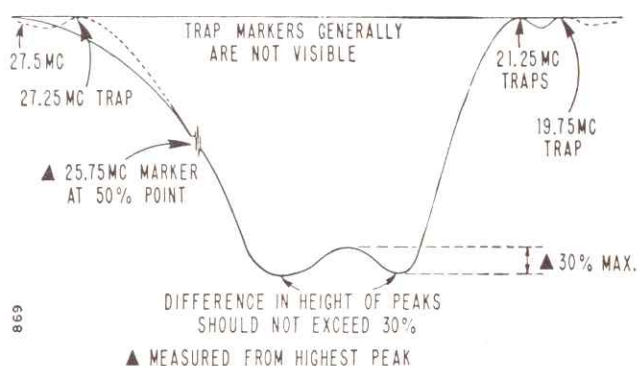


Figure 26. Overall RF and Video IF Response Curve.
Portion of curve in dotted lines applies only to sets having adjacent channel traps (19.75 MC and 27.25 MC).

ALIGNMENT HINT

After becoming familiar with alignment procedure, some servicemen simplify subsequent alignment of sets by using merely the essential alignment data given in figure 21.

OSCILLOSCOPE NOTE

In dealing with RF and IF response curves, it is well to remember that an inverted or mirror image may result, depending on the sweep generator and oscilloscope used. The general waveform should still be identical.

When using a wide band oscilloscope for alignment,

marker pips will be more distinct if condenser from 100 to 1,000 mmfd. is connected across the oscilloscope input. Note: Use the lowest capacity condenser possible, since too high a capacity will affect the shape of the response curve.

FRINGE AREA ALIGNMENT

If the curve shown in figure 26 is obtained with correct marker location and equal peaks, but the best picture and clearest sound do not "tune in" together (due to weak signal strength which is generally found in fringe areas), operation may be improved with a special

Fringe Area Alignment. See Form No. S346 (available from the Admiral distributor) for information on "Fringe Area Television Reception And Fringe Area Alignment."

PARTS LIST

Electrical components have symbols in 100 series, 200 series, etc., according to location on schematic. Order parts by part number and description from Admiral Distributor.

24D1, 24E1, 24F1, 24G1, 24H1, 5B2, 5D2 CHASSIS PARTS

RESISTORS			Sym.	Description	Part No.
Sym.	Description	Part No.			
*R101	3,900 ohms, 1/2 watt.....	98A 45-16	R330	6,000 ohms, Pot. (Focus).....	75B 13-15
R102	47,000 ohms, 1/2 watt.....	98A 45-17	R401	22,000 ohms, 1/2 watt.....	60B 8-223
R103	10,000 ohms, 1/2 watt.....	98A 45-18	R402	8,200 ohms, 1/2 watt.....	60B 8-822
R104	2,200 ohms, 1/2 watt.....	98A 45-19	R403	8,200 ohms, 1/2 watt.....	60B 8-822
*R105	4,700 ohms, 1/2 watt.....	98A 45-20	R404	1.2 megohm, 1/2 watt.....	60B 8-125
R106	220,000 ohms, 1/2 watt.....	98A 45-21	R405	1 megohm (Vertical Hold).....	75B 13-14
R107	10,000 ohms, 1/2 watt.....	98A 45-18	R406	6.8 megohm, 1/2 watt.....	60B 8-685
*R108	4,700 ohms, 1/2 watt.....	98A 45-20	R407	100,000 ohms, 1/2 watt.....	60B 8-104
R109	15,000 ohms, 1/2 watt.....	98A 45-67		270,000 ohms, 1/2 watt, in sets	
R201	82 ohms, 1/2 watt.....	60B 8-820	R408	with round picture tube.....	60B 8-274
R202	47,000 ohms, 1 watt.....	60B 14-473		1 megohm, 1/2 watt, in sets with	
R203	39,000 ohms, 1/2 watt.....	60B 8-393		rectangular picture tube.....	60B 8-105
R204	15,000 ohms, 1/2 watt.....	60B 8-153	R409	2.5 megohm, Pot. (Height).....	75B 13-3
R205	47,000 ohms, 1 watt.....	60B 14-473	R410	8,200 ohms, 1/2 watt.....	60B 8-822
R206	1000 ohms, 1/2 watt.....	60B 8-102	R411	1 megohm, 1/2 watt.....	60B 8-105
R207	150 ohms, 1/2 watt.....	60B 8-151	R412	6,000 ohms, Pot. (Vertical Linearity).....	75B 13-1
R208	15,000 ohms, 1/2 watt, 5%.....	60B 7-153	R413	1,000 ohms, 1 watt.....	60B 14-102
R209	15,000 ohms, 1/2 watt, 5%.....	60B 7-153	R414	560 ohms, 1/2 watt.....	60B 8-561
R210	820 ohms, 1/2 watt.....	60B 8-821	R415	560 ohms, 1/2 watt.....	60B 8-561
R211	27,000 ohms, 1/2 watt.....	60B 8-273	R416	270,000 ohms, 1/2 watt.....	60B 8-274
R212A	250,000 ohms, (Volume).....	Dual Pot. 75B 11-14	R417	2,200 ohms, 2 watt.....	60B 20-222
R212B	25,000 ohms, (Picture).....		R418	2.2 megohm, 1/2 watt.....	60B 8-225
	(R212 includes switch SW501)		R419	18,000 ohms, 1/2 watt.....	60B 8-183
R213	4.7 megohm, 1/2 watt.....	60B 8-475	R420	22,000 ohms, 1/2 watt.....	60B 8-223
R214	270,000 ohms, 1/2 watt.....	60B 8-274	R421	4.7 megohm, 1/2 watt.....	60B 8-475
R215	470,000 ohms, 1/2 watt.....	60B 8-474	R422	3,300 ohms, 1/2 watt.....	60B 8-332
R216	270 ohms, 1 watt.....	60B 14-271	R423	3,300 ohms, 1/2 watt.....	60B 8-332
R217	47,000 ohms, 1/2 watt.....	60B 8-473	R424	100,000 ohms, 1/2 watt, 5%.....	60B 7-104
R218	18,000 ohms, 1/2 watt.....	60B 8-183	R425	100,000 ohms, 1/2 watt, 5%.....	60B 7-104
R219	4.7 ohms, 1/2 watt.....	60B 28-11	R426	4.7 megohm, 1/2 watt.....	60B 8-475
R221	1 megohm, 1/2 watt.....	60B 8-105	R427	470,000 ohms, 1/2 watt.....	60B 8-474
R222	150,000 ohms, 1/2 watt.....	60B 8-154	R428	15,000 ohms, 1/2 watt.....	60B 8-153
R301	5,600 ohms, 1/2 watt.....	60B 8-562	R429	5,600 ohms, 1/2 watt.....	60B 8-562
R302	39 ohms, 1/2 watt.....	60B 8-390	R430	1,500 ohms, 1/2 watt, 5%.....	60B 7-152
R303	1,000 ohms, 1/2 watt.....	60B 8-102		See "Horizontal Oscillator Cathode Resistor	
R304	12,000 ohms, 1/2 watt.....	60B 8-123		R430 Changed" on page 40.	
R305	1,000 ohms, 1/2 watt.....	60B 8-102	R431	82,000 ohms, 1/2 watt.....	60B 8-823
R306	1,000 ohms, 1/2 watt.....	60B 8-102	R432	25,000 ohms, Pot. (Horizontal Hold).....	75B 13-13
R307	39 ohms, 1/2 watt.....	60B 8-390	R433	12,000 ohms, 2 watt.....	60B 20-123
R308	33,000 ohms, 1/2 watt.....	60B 8-333	R434	100,000 ohms, 1/2 watt.....	60B 8-104
R309	1,000 ohms, 1/2 watt.....	60B 8-102	R435	27,000 ohms, 1/2 watt.....	60B 8-273
R310	100 ohms, 1/2 watt.....	60B 8-101	R436	47,000 ohms, 1/2 watt.....	60B 8-473
R312	1,000 ohms, 1/2 watt.....	60B 8-102	R437	47,000 ohms, 1/2 watt.....	60B 8-473
R313	33,000 ohms.....	Part of L302	R438	22,000 ohms, 1/2 watt.....	60B 8-223
R314	33,000 ohms, 1/2 watt.....	60B 8-333	R439	8,200 ohms, 1/2 watt.....	60B 8-822
R315	10,000 ohms, 1/2 watt.....	60B 8-103	R440	220,000 ohms, 1/2 watt.....	60B 8-224
R316	3,300 ohms, 1/2 watt.....	60B 8-332	R441	68 ohms, 1/2 watt.....	60B 8-680
R317	100,000 ohms, 1/2 watt.....	60B 8-104		470,000 ohms (in sets with round	
R318	4,300 ohms, 1 watt.....	60B 14-432		picture tubes).....	60B 8-474
R319	33,000 ohms.....	Part of L304	R442	1 megohm (in sets with rect.	
R320	33,000 ohms.....	Part of L305		picture tubes).....	60B 8-105
R321	220,000 ohms, 1/2 watt.....	60B 8-224	R443	150 ohms, 2 watt.....	60B 20-151
R322	33,000 ohms, 1/2 watt.....	60B 8-333	R444	27,000 ohms, 2 watt.....	60B 20-273
R323	100,000 ohms, Pot. (Brightness).....	75B 13-12	R445	470,000 ohms, 1 watt.....	60B 28-43
R324	10,000 ohms, 1/2 watt.....	60B 8-103	R446	1,000 ohms, 1/2 watt.....	60B 8-102
R325	Picture Control.....	See R212B	R447	56,000 ohms, 1 watt.....	60B 14-563
R326	15,000 ohms, 1/2 watt.....	60B 8-153	R448	100 ohms, 1/2 watt.....	60B 8-101
R327A	20,000 ohms, 5 watt.....	Tapped Candohm... 61B 13-1		See "Run 5 in 24D1, 24E1, 24F1, 24G1"	
R327B	1,000 ohms, 2 watt.....			on page 38.	
R327C	4,500 ohms, 5 watt.....		R501	1,000 ohms, 5 watt.....	61A 3-13
R328	22,000 ohms, 2 watt.....	60B 20-223	R502	270,000 ohms, 1/2 watt.....	60B 8-274
	See "Run 3 in 24D1, 24E1, 24F1, 24G1"		R503	270,000 ohms, 1/2 watt.....	60B 8-274
	on page 38.		R504	3.3 ohms, 1/2 watt.....	60B 28-10

*To secure proper high frequency characteristics, order exact part from Admiral distributor or use IRC metalized resistor only.

Sym.	Description	Part No.
R601	1.5 megohm, $\frac{1}{2}$ watt.....	60B 8-155
R602	240 ohms, $\frac{1}{2}$ watt, 5% (used in all 5B2 and in early 5D2 sets)	60B 7-241
	1500 ohms, $\frac{1}{2}$ watt (used in late 5D2 sets)	60B 8-152
	Before replacing in 5D2 sets, see sensitivity change on page 46.	
R603	22,000 ohms, $\frac{1}{2}$ watt.....	60B 8-223
R604	470 ohms, $\frac{1}{2}$ watt.....	60B 8-471
R605	820 ohms, $\frac{1}{2}$ watt.....	Part of L606
R606	470 ohms, $\frac{1}{2}$ watt.....	60B 8-471
R607	22 ohms, $\frac{1}{2}$ watt.....	60B 8-220
R608	1 megohm, $\frac{1}{2}$ watt.....	60B 8-105
R609	6,200 ohms, $\frac{1}{2}$ watt, 5%.....	60B 7-622
R610	470,000 ohms, $\frac{1}{2}$ watt.....	60B 8-474
R611	10,000 ohms, $\frac{1}{2}$ watt.....	60B 8-103
R612	1,000 ohms, $\frac{1}{2}$ watt.....	60B 8-102
R613	47,000 ohms, $\frac{1}{2}$ watt.....	60B 8-473
R614	390 ohms, $\frac{1}{2}$ watt.....	60B 8-391
R615	27,000 ohms, $\frac{1}{2}$ watt.....	60B 8-273
R616	15,000 ohms, $\frac{1}{2}$ watt.....	60B 8-153
R617	15,000 ohms, $\frac{1}{2}$ watt.....	60B 8-153
R618	100,000 ohms, $\frac{1}{2}$ watt.....	60B 8-104
R619A	2 megohm, Volume {	Dual Control.....75B 11-12
R619B	2 megohm, Tone }	
	(R619 includes on-off switch SW603)	
R620	10 megohm, $\frac{1}{2}$ watt.....	60B 8-106
R621	7,500 ohms, 5 watt.....	61A 1-18
	(Two 15,000 ohms, 2 watt resistors in parallel used in some sets.)	
R622	560,000 ohms, $\frac{1}{2}$ watt.....	60B 8-564
R623	22 ohms, $\frac{1}{2}$ watt.....	60B 8-220
R625	22 ohms, $\frac{1}{2}$ watt.....	60B 8-220
R627	1,000 ohms, 1 watt.....	60B 14-102

CONDENSERS

C101	5 mmfd., ± 5 mmfd, Zero Temp. Coeff.....	98A 45-22
C102	.5 to 3 mmfd, Ceramic Trimmer.....	98A 45-87
C103	.001 mfd. min., Ceramic.....	98A 45-24
C104	.5 to 3 mmfd, Ceramic Trimmer.....	98A 45-23
C105	120 mmfd, 5%, Ceramic, —750 Temp. Coeff.....	98A 45-25
C106	100 mmfd, Cer, —750 Temp. Coeff.....	98A 45-26
C107	.5 to 3 mmfd, Ceramic Trimmer.....	98A 45-23
C108	20 mmfd, Cer, Zero Temp. Coeff.	98A 45-27
C109	10 mmfd, 5%, Cer, —750 Temp. Coeff.....	98A 45-79
C110	.5 to 3 mmfd, Ceramic Trimmer.....	98A 45-23
C111	3 to 5 mmfd, Tuning Rotor.....	98A 45-92
C112	.001 mfd. min.} Dual Ceramic	98A 45-93
C113	.001 mfd. min.}	
C114	10 mmfd, 5%, Cer, Zero Temp. Coeff.....	98A 45-64
C115	72 mmfd, 3%, Silver Mica.....	98A 45-65
C116	300 mmfd, Ceramic.....	98A 45-66
C201	120 mmfd, 3%, Silver Mica.....	65B 1-10
C202A	1500 mmfd. min.}	Dual Ceramic 65A 17-2
C202B	1500 mmfd. min.}	
C203	100 mmfd, —.00075 Temp. Coeff., Ceramic	65B 6-19
C204	30 mmfd.	Part of T201
C205A	1500 mmfd. min.}	Dual Ceramic 65A 17-2
C205B	1500 mmfd. min.}	
C206	35 mmfd.	Part of T202
C207	330 mmfd., Mica.....	65B 21-331
C208	4 mfd., 50 volt, Electrolytic.....	67B 16-1
C209	.047 mfd, 600 volts, Paper.....	64B 8-9
C210	.0022 mfd., 600 volts, Paper.....	64B 8-17
C211	.01 mfd., 600 volts, Paper.....	64B 8-13
C212	.01 mfd., 600 volts, Paper.....	64B 8-13
C213	.047 mfd, 600 volts, Paper.....	64B 8-9
C214	.0022 mfd, 1000 volts, Paper.....	64A 2-11
C215	.01 mfd., 600 volts, Paper.....	64B 8-13
C216	Part of four-section Electrolytic.....	See C501D
C217	Part of four-section Electrolytic.....	See C501C

Sym.	Description	Part No.
C218	.1 mfd., 600 volts, paper.....	64B 8-7
C219	.022 mfd., 600 volts, paper.....	64B 8-11
C301A	1500 mmfd. min.}	Dual Ceramic 65A 17-2
C301B	1500 mmfd. min.}	
C302A	1500 mmfd. min.}	Dual Ceramic 65A 17-2
C302B	1500 mmfd. min.}	
C303	120 mmfd, 3%, Silver Mica.....	65B 1-10
C304	1500 mmfd. min, Ceramic.....	65A 10-4
C305	250 mmfd, 3%, —.00047 Temp. Coeff., Ceramic	65B 6-21
C306	10 mmfd, 5%, 0 to .0008 Temp. Coeff., Ceramic	65B 6-69
C307	120 mmfd, 3%, Silver Mica.....	65B 1-10
C308	.01 mfd., 600 volts, Paper.....	64B 8-13
C309	Part of Four-section Electrolytic.....	See C502C
C311	.2 mfd., 200 volts, Paper.....	64B 5-29
C312	.047 mfd, 600 volts, Paper.....	64B 8-9
C313	120 mmfd., Mica.....	65B 1-10
C314	180 mmfd., Mica.....	65B 1-71
C401	.0022 mfd., 600 volts, Paper.....	64B 8-17
C402	.005 mfd., 600 volts, Paper.....	64B 5-12
C403	.0047 mfd., Mica.....	65B 21-472
C404	.0047 mfd., Mica.....	65B 21-472
C405	.1 mfd., 600 volts, Paper.....	64B 8-7
C406	.05 mfd., 600 volts, Paper.....	64B 5-7
C407	20 mfd., 475 volts, Electrolytic.....	67A 21-1
C408	Part of four-section Electrolytic.....	See C502D
C409	.5 mfd., 200 volts, Paper.....	64B 6-27
C410	.05 mfd., 600 volts, Paper.....	64B 5-7
C411	120 mmfd., Mica.....	65B 21-121
C412	.001 mfd., Mica.....	65B 21-102
C413	.001 mfd., Mica.....	65B 21-102
C414	.005 mfd., 600 volts, Paper.....	64B 5-12
C415	.01 mfd., 600 volts, Paper.....	64B 8-13
C416	3,900 mmfd., $\pm 5\%$, Silver Mica.....	65B 1-63
C417	.047 mfd., 600 volts, Paper.....	64B 8-9
C418	330 mmfd., Mica.....	65B 21-331
C419	330 mmfd., Mica.....	65B 21-331
C420	270 mmfd., Mica.....	65B 21-271
C421	100 mmfd, Mica.....	65B 22-101
C424	20 to 280 mmfd., Trimmer (Hor. Drive)	66A 30-1
C425	4 mfd., 450 volts, Electrolytic.....	67A 19-2
C426	.5 mfd., 200 volts, Paper.....	64B 6-27
C427	.005 mfd., 600 volts, Paper.....	64B 5-12
C428	.001 mfd., Mica.....	65B 21-102
C429	.1 mfd., 400 volts, Paper.....	64B 8-26
C430	.05 mfd., 600 volts, Paper.....	64B 5-7
C431	4 mfd., 25 volts, Electrolytic.....	67A 4-3
C432	.05 mfd., 200 volts, Paper.....	64A 2-8
C433	.25 mfd., 600 volts, Paper.....	64B 6-3
C434	.02 mfd., 400 volts, Paper.....	64A 2-9
C435	500 mmfd, 20,000 volts, Ceramic in early sets, condenser with tapped hole at one end and threaded stud at other end.....	65B 18-4
	in late sets, condenser with threaded stud at both ends.....	65B 18-5
C436	{ 47 mmfd, Mica in sets with 16" picture tubes	65B 1-64
	{ 75 mmfd, Mica in sets with 19" picture tubes	65B 1-66
C437	{ .1 mfd., 400 volts in sets with round picture tube	64B 8-26
	{ .22 mfd., 400 volts, in sets with rectangular picture tube.....	64B 9-24
C501A	40 mfd., 450 volts	Electrolytic 67C 15-13
C501B	40 mfd., 450 volts	
C501C	10 mfd., 450 volts	
C501D	20 mfd., 25 volts	

Sym.	Description	Part No.
C502A	40 mfd., 250 volts	Electrolytic 67C 15-14
C502B	100 mfd., 250 volts	
C502C	10 mfd., 250 volts	
C502D	100 mfd., 50 volts	
C601	2-20 mmfd, Trimmer.....	Part of L601
C602	.001 mfd. min, Ceramic.....	65B 6-41
C603A	486 mmfd. (max.) AM RF	}Gang..... 68B 24
C603B	15 mmfd. (max.) FM RF	
C603C	114 mmfd (max.) AM Osc.	
C603D	15 mmfd. (max.) FM Osc.	
	Dial drum spotwelded to gang.	
C604	.01 mfd. min, Ceramic.....	65A 10-3
C605	.68 mmfd, Ceramic.....	65A 16-1
C606	40 mmfd, Cer, —.000750 Temp. Coeff.....	65B 6-67
C607	.001 mfd, Ceramic.....	65B 6-41
C608	40 mmfd, Silver Mica (used in all 5B2 and in early 5D2 sets)	65B 1-65
	30 mmfd, Silver Mica (used in late 5D2 sets)	65B 1-69
	Before replacing in 5D2 sets, see sensitivity change on page 46.	
C609	.001 mfd, Silver Mica, 5%.....	Part of T604
C610	.01 mfd. min, Ceramic.....	65A 10-3
C611	.01 mfd. min, Ceramic.....	65A 10-3
C612	100 mmfd, Silver Mica, 5%.....	Part of T601
C613	300 mmfd, Silver Mica, 5%.....	Part of T604
C614	.01 mfd. min, Ceramic.....	65A 10-3
C615	.01 mfd. min, Ceramic.....	65A 10-3
C616	.01 mfd. min, Ceramic.....	65A 10-3
C617	250 mmfd, Ceramic.....	65B 6-5
C618	200 mmfd, Silver Mica, 5%.....	Part of T605
C619	100 mmfd, Silver Mica, 5%.....	Part of T602
C620	200 mmfd, Silver Mica, 5%.....	Part of T605
C621	.01 mfd. min, Ceramic.....	65A 10-3
C622	.01 mfd. min, Ceramic.....	65A 10-3
C623	100 mmfd. }	}Dual Ceramic 63A 7-1
C624	100 mmfd. }	
C625	4 mfd, 150 volts, Electrolytic.....	67A 4-2
C626	.001 mfd. min, Ceramic.....	65B 6-41
C627	.01 mfd. min, Ceramic.....	65A 10-3
C628	100 mmfd, Cer, —.000750 Temp. Coeff.....	65B 6-68
C629	.001 mfd, Ceramic.....	65B 6-41
C630	.01 mfd. min, Ceramic.....	65A 10-3
C631	.1 mfd, 400 volts, Paper.....	64B 1-20
C632	.005 mfd. min, Ceramic.....	65A 10-1
C633	5 mmfd, Ceramic.....	65B 6-61
C634	2.5 to 6 mmfd., Ceramic Trimmer.....	66A 28-1
C635	90 mmfd, Silver Mica, 3%.....	Part of T603
C636	.004 mfd. min. }	}Dual Ceramic 65A 17-1
C637	.004 mfd. min }	
C638	.01 mfd. min, Ceramic.....	65A 10-3
C639	.01 mfd. min, Ceramic.....	65A 10-3
C641	.1 mfd, 400 volts, Paper.....	64B 1-20

COILS, TRANSFORMERS

L101	Antenna Coil	
	for Channel #2.....	98A 62-2
	for Channel #3.....	98A 62-3
	for Channel #4.....	98A 62-4
	for Channel #5.....	98A 62-5
	for Channel #6.....	98A 62-6
	for Channel #7.....	98A 62-7
	for Channel #8.....	98A 62-8
	for Channel #9.....	98A 62-9
	for Channel #10.....	98A 62-10
	for Channel #11.....	98A 62-11
	for Channel #12.....	98A 62-12
	for Channel #13.....	98A 62-13

Sym.	Description	Part No.
L102	Mixer—Oscillator Coil	
	for Channel #2.....	98A 63-2
	for Channel #3.....	98A 63-3
	for Channel #4.....	98A 63-4
	for Channel #5.....	98A 63-5
	for Channel #6.....	98A 63-6
	for Channel #7.....	98A 63-7
	for Channel #8.....	98A 63-8
	for Channel #9.....	98A 63-9
	for Channel #10.....	98A 63-10
	for Channel #11.....	98A 63-11
	for Channel #12.....	98A 63-12
	for Channel #13.....	98A 63-13
L103	Choke, Heater RF	98A 45-13
L104	Choke, Heater Oscillator	98A 45-14
L105	Coil, Choke	98A 45-72
L106	Coil, 1st IF.....	98A 45-69
L201	Coil, Sound Trap.....	72C 96-1
L301	RF Input Choke	73A 6-1
L302	Video Peaking Coil, 90 Microhy.....	73A 5-4
	(wound on R313)	
L303	4.5 MC Trap, 7.3 Microhy.....	73A 4-1
L304	Series Peaking Coil, 250 Microhy	
	(wound on R319)	73A 5-5
L305	Shunt Peaking Coil, 250 Microhy	
	(wound on R320)	73A 5-5
L306	Focus Coil (less plug used in 19" sets) ..	69C 117-1
L307	RF Filament Choke.....	73A 2-1
L308	RF Filament Choke.....	73A 2-1
L309	Adjacent Channel Trap (27.25 MC) }	A3320
L310	Adjacent Channel Trap (19.75 MC) }	
	(Assembly includes C313, C314 and mtg. bracket)	
	See production change on page 39.	
L401	Horizontal Lock Coil	
	(includes C416 and R429)	94A 17
L402	Horizontal Linearity Control Coil	94A 28
L403	Width Control Coil	94A 29-1
L501	Filter Choke	
	for sets with 6SQ7 Audio Amp.....	74B 18-1
	for sets with 6AU6 Audio Amp.	74B 18-3
L601	Antenna, AM	
	Loop Antenna (includes C601, C633) ..	69C 116-1
	Iron Core Ant. (includes C601, C633) ..	69C 121
L602	{FM Antenna, for 16" sets.....	AB195
	{FM Antenna, for 19" sets.....	AB211
L603	Antenna Coil (FM).....	69A 85
L604	Coil, Osc. (AM).....	69A 86-1
L605	Coil, Osc. (FM).....	69A 87
L606	Coil, FM Peaking (wound on R605)	73A 5-11
L610	Choke, RF Dual.....	69A 102
L620	Choke Filter	74B 18-2
T201	Sound IF Transformer	72B 86-2
T202	Ratio Detector Transformer.....	72B 87-1
T203	Audio Output Transformer	
	for sets with 6SQ7 Audio Amp.	79A 31-1
	for sets with 6AU6 Audio Amp.	79A 31-4
T301	1st Video IF Transformer	72C 96-5
T302	2nd Video IF Transformer	72C 96-3
T303	21.25 MC Sound Trap.....	72C 96-2
T304	3rd Video IF Transformer.....	72C 96-4
T401	Vertical Blocking Osc. Transformer.....	79A 18-2
T402	Vertical Output Transformer.....	79B 29-1

Sym.	Description	Part No.
T403	Deflection Yoke for 16" round tubes A3178 for 16" rectangular tubes A3222 for 19" round tubes (includes plugs) ... A3197	
T404	Horizontal Output Transformer Coil and Terminal Strip (less iron core and mtg. hardware) 79C 30-11 (If T404 transformer core is not usable order complete transformer part number 79C30-1.)	
T501	Power Transformer for sets with 6SQ7 Audio Amp. 80B 24-1 for sets with 6AU6 Audio Amp. 80C 25-1	
T601	Transformer, 1st IF (FM) all 5B2 and early 5D2 sets 72B 98 late 5D2 sets 72B 98-1 Before replacing in 5D2 sets, see sensitivity change on page 46.	
T602	Transformer, 2nd IF (FM) 72B 76	
T603	Transformer, Ratio Det. 72B 39	
T604	Transformer 1st IF (AM) all 5B2 and early 5D2 sets 72B 97 late 5D2 sets 72B 97-1 Before replacing in 5D2 sets, see sensitivity change on page 46.	
T605	Transformer, 2nd IF (AM) 72B 94	

MISCELLANEOUS PARTS FOR TV CHASSIS

Picture tube mounting parts listed below are for 16" tubes. See separate heading for 19" tube mounting parts.

M201	{Speaker, 10" PM. 78B 47-1 {Speaker, 12" PM for "television only" models 78B 56-2 for 16" combination models 78B 56-1 for 19" combination models 78B 55-1	
M202	Socket, Audio Output 88A 1	
M203	Socket, Speaker 88A 5-6	
M204	Plug, Speaker 88A 5-5	
M401	Fuse, Horizontal Output (1/4 amp., 250 V.) 84A 4-2	
M501	Line Cord, with interlock socket 89A 22-1	
M502	Interlock Plug 89A 22-2	
M503	Fuse, Line (4 amp. 250 V.) 84A 1-18	
M504	Socket, Cable (combination models only) . 88A 20-2	
M505	Socket, Light (4 contact, wafer; used only in combination sets) 87A 6-3	
SW501	Switch, On-Off Power (S.P.D.T.) Part of R212	
Adjacent Channel Trap Assembly Complete (in- cludes L309, L310, C313, C314, and bracket) .. A3320		
Band, Tube Front Insulating (plastic) 33B 59-1		
Band, Tube Front Mounting (metal) 28A 40-1		
Bracket, Deflection Yoke Holding 15A 572		
Bracket, Picture Tube and Focus Coil Mounting Base 15C 575		
Bracket, Picture Tube Mounting (Supports front of round picture tubes) 15C 576		
Bracket, Picture Tube Mounting (Supports front of rectangular picture tubes) right side (facing tube) 15B 615-1 left side (facing tube) 15B 615-2		
Bracket, Picture Tube Mounting (supports neck of picture tube) for sets with rectangular picture tubes Top 15C 613 Bottom 15C 614 for early sets with 16" round tubes Top 15C 571 Bottom 15C 575 for late sets with 16" round tubes Top 15C 628-1 Bottom 15C 627		

Sym.	Description	Part No.
	Bracket, Tuner Shaft (bakelite) 32A 111-1	
	Clamp, Picture Tube Front Mounting Bracket (clamps bracket to chassis) 15A 616	
	Connector Lead, 2nd Anode with plug for 16" rectangular tube 88A 16-7 with contact spring for 16" round tube A3171 with female plug for 19" round tube 88A 25-1 with male plug and contact spring for 19" round tube A3200	
	Contact Spring, 2nd Anode (between picture tube metal edge and polystyrene ring) 18A 37	
	Cover, IF Strip 15C 579	
	Fuse Holder 84A 5-3	
	Insulating Cone, Picture Tube (polyethylene sheet) (not used in late sets) 32B 114-2	
	Ion Trap for 16GP4, 16TP4 and 19AP4 pic. tubes 94A 15-2 for 16RP4 picture tube 94A 15-1	
	Lever, Focus Coil Adjusting 15B 574	
	Lock, 1B3 Mounting Shell Disk 15A 589	
	Rod, Round Picture Tube Mounting 28A 40-1	
	Rubber Channel (1" length, used in mtg. rectangular picture tube) 12A 9-11	
	Rubber Collar (mounted over picture tube neck) 12B 40	
	Rubber Grommet, 2nd Anode Housing 12A 2-7	
	Spring, Picture Tube Grounding (used on rectangular tubes only) 19A 23-2	
	Socket, Jewel Light 87A 6-3	
	Socket, Picture Tube 87A 31-2 for 16" Picture Tube 87B 31-5 for 19" Picture Tube 87B 31-6	
	Socket, Tube miniature bakelite (7 pin) 87A 3-7 octal, plain 87A 5-1 octal, ringmount (Mica filled) 87A 20 miniature (9 pin) 87A 25-1	
	Tuner, Television (complete) 94C 18-3	

PARTS FOR MOUNTING 19" PICTURE TUBE

M301	Socket, Focus Coil (4 contact, wafer) 87A 6-3	
M302	Plug, Focus Coil (4 pin) 88B 22-1 Cover & Insulator (for 88B22-1 plug) 88B 22-3	
M403	Socket, Deflection Yoke (6 contact; molded) 87A 30-2	
M404	Plug, Deflection Yoke (6 pin) 88A 9-1 Cover & Insulator (for 88A9-1 plug) 88A 17	
Band, Tube Front Insulating (Plastic) 33B 59-2		
Band, Tube Mounting (Metal) 28A 40-2		
Bracket, Strap (supports yoke coil) 15A 572		
Bracket, Tube Mtg. (supports front of tube) for right side facing tube 15C 564-1 for left side facing tube 15C 564-2		
Bracket, Picture Tube Mounting (supports neck of picture tube) for early 19" sets top 15C 571 bottom 15C 575 for late 19" sets top 15C 628-2 bottom 15C 627		
Connector Lead, 2nd Anode with female plug 88A 25-1 with male plug A3200		
Ground Wire Assembly A3209		
Insulating Cone, Picture Tube (polyethylene sheet) (not used in late sets) 32B 114-1		
Ion Trap 94A 15-2		
Lever, Picture Positioning 15B 574		
Nut (8-32 Hex, for tube band) 2A 1-15-71		
Picture Tube, 19" 19AP4		

Rubber Collar (supports flare of picture tube) ..	12B 37
Screw, Wing (for deflection yoke)	1A 101-171
Shim, Focus Coil Mtg.	32A 134
Spacer Sleeve ($\frac{1}{8}$ " in length)	29A 2-3-71
Spring, HV Contact at front of tube	18A 37
Tape, Aluminum Foil (order length needed)	52A 1-17
Washer, Spring (for mounting focus coil adjusting lever)	4A 5-10

MISCELLANEOUS PARTS FOR TV TUNER 94C18-3

See page 30 for TV tuner parts illustration.

M104 Shaft Shell & Rotor Assy. (Tuning) (with $4\frac{1}{8}$ " long brass shaft shell)	98A 45-92
M107 Bracket, Tuning Rotor Retaining	98A 45-95
M108 Spring, Detent Plate Grounding	98A 45-94
M109 Shield, Tube (Slotted; for 6J6)	98A 45-73
M110 Shield, Tube (Plain; for V101)	98A 45-36
M112 Spring, Slug Retaining (Osc. coil)	98A 45-52
M113 Washer, Fibre Spacer ($\frac{1}{4}$ " IDx $\frac{1}{2}$ " OD) ..	98A 45-63
M114 Nut, Locking Spring (for trimmers)	98A 45-31
M115 Screw, Trimmer (4-36x $\frac{5}{8}$ ")	98A 45-33
M116 Screw, Bracket Mounting (6-32x $\frac{1}{4}$ ") ..	98A 45-62
M117 Slug, Brass Tuning	98A 45-88
M118 Stator Plate (ungrounded); Silver with Ceramic Insulator, for Tuning C111 (includes mtg. bracket)	98A 45-86
M120 Tuner, Television (complete)	94C 18-3
M121 Roller, Detent ($\frac{3}{8}$ " dia., $\frac{3}{8}$ " dia. bearing) ..	98A 45-82
M122 Spring, Detent (2 $\frac{5}{8}$ " long)	98A 45-81
M123 Contact Plate and Bracket Assembly (Uses Wiping Contacts)	98A 45-84
M124 Spring, Tuning Rotor Contact (Flat bronze 1 $\frac{1}{8}$ "x $\frac{1}{2}$ ")	98A 45-83
M125 Spring, Front and Rear Turret Shaft (Wire 2 $\frac{3}{4}$ " long, $\frac{3}{8}$ " dia.)	98A 45-85
M126 Turret and Shaft Assembly (less coils) (5 $\frac{3}{8}$ " shaft and $\frac{3}{8}$ " rounded detent depression)	98A 45-91

MISCELLANEOUS PARTS FOR 5B2, 5D2 RADIO

M601 Socket, Phono Input	88A 1
M606 Socket, Phono Motor	88A 8-7
M607 Plug and Shielded Cable	89A 29-6
M608 Plug, 14 Pin	88A 20-1
Cover, Plug (for M608)	88A 20-12
Cable (11 wire), includes plug M608 ..	AB208
Cable (12 wire), includes plug M608 ..	AB216
M609 Socket and Leads, Pilot Light	
M610 Socket and Leads, Pilot Light with one lead	82A 3-3
with two leads	82A 2-3
M623 Socket, 14 Contact	88A 20-2
SW601 Switch, "PH-AM-FM" (includes SW602) ..	76B 22
SW602 Switch, Phono Motor	76B 23
SW603 Switch, On-Off Power (S.P.D.T.)	Part of R619

PARTS FOR TILT-OUT MECHANISM

Eye Bolt (for Tilt-Out Spring)	1A 87-1
Grommet, Rubber (for Tilt-Out Spring)	12A 1-1
Hinge Assembly, Tilt-Out Copper Hammertone Finish Left Side (facing front)	AC183-1
Right Side (facing front)	AC183-2
Gold Hammertone Finish Left Side (facing front)	AC183-3
Right Side (facing front)	AC183-4
Screw, Tilt-Out Locking (10-24x $\frac{3}{8}$ " S.T.)	1A 51-25-71
Screw, Tilt-Out Adjusting Bracket Mtg. (#8-32x $\frac{1}{4}$ " Bd. H. M. S.)	85-250-C2-71
Screw, Tilt-Out Tie Rod Mtg. (#6-32x $\frac{1}{4}$ " Bd. H. M. S.)	365-250-C2-58
Spring, Tilt-Out Coil (2 $\frac{3}{8}$ " unstretched)	19A 15-1

Antenna Lead (300 ohm transmission line, 32" length)	95A 16-11
Bracket, Tuning Shaft	15A 394
Clamp, Cable	11A 2-6
Cover Assembly, Chassis	A1880
Dial Back and Bracket Assembly	A3153
Dial Cord (44" length needed)	50A 1-3
Dial Scale	22B 22-1
Escutcheon, Radio	23D 63-1
Grommet, Rubber (Gang mounting)	12A 1-4
Pilot Light (#47)	81A 1-8
Plate, Switch	15A 409
Pointer, Metal Dial	25A 37
Pointer Cover, Plastic	25A 38
Shaft, Tuning	28A 48-2
Sleeve, Spacer (Gang mounting)	29A 2-10-71
Sleeve, Spacer (AM loop mtg.)	29A 3-15
Snap Button (for mounting dial scale)	13A 1-1-71
Socket, Tube for Miniature Tube (7 pin)	87A 3-7
for Miniature Tube (9 pin)	87A 25-2
Speed Nut (for mounting radio escutcheon) ..	2B 10-24-59
Spring, Dial Cord Tension	19B 1-3
Spring, Tube Retainer (for 12AT7)	19A 56-1

PHONOGRAPH PARTS

Model RC500 or Model RC550 record changers are used. The changer model number is on the top rear of the changer pan and also on the changer model label on the underside of the changer. For the RC500 changer, refer to Service Manual No. S298; for RC550 changer, see Service Manual No. S327.

M602 Cable, Shielded (includes plug)	413A 11-2
M603 Cartridge, Push-in Needle Type (includes needle)	409A 13-1
Cartridge, Knurled Nut Retaining Type (includes needle)	409A 13
(Cartridges with needles are interchangeable.)	
M604 Motor (3 speed)	407B 19
M605 Plug, Motor (Male)	88A 8-1
Adapter, 45 RPM Record (envelope of 12) ..	48A 8-1
Belt, Rubber Drive	406A 20
Idle Wheel Assembly (includes tire)	G400A 279
Manual, Service for RC500 changer	S298
for RC550 changer	S327
Needle, Phonograph for 409A 13 cartridge	98A 15-19
for 409A 13-1 cartridge	98A 15-18
Needle Retaining Nut (for 409A 13 cartridge) ..	98A 54-2
Plug Button	13A 2-8-57
Spring, Changer Float	405A 139
Touch-Up Paint Copper Hammertone	98A 54-3
Gold Hammertone	98A 54-12

CABINET PARTS

Spring, Tilt-Out Arm Retaining (7 $\frac{1}{4}$ " unstretched)	19A 59
Tie Rod, Tilt-Out	28A 22-1

PARTS FOR PHONO COMPARTMENT AND PILOT LIGHTS

M506 Socket and Leads (candelabra)	82A 12-1
M507 Plug (4 pin round)	88B 22-1
Cover and Insulator for 88B22-1	88B 22-3
M508 Socket and Leads (miniature)	82A 11-56
SW502 Switch, Light	77A 29
Bracket, Switch	15B 502
Bulb, Light (7 watt candelabra Mazda #7C7) ..	81A 2-4
Bulb, Light (miniature #47 Mazda)	81A 1-8
Light Assembly, Complete (less bulbs)	AB209
Shield, Light	82A 13
Washer, Insulating	5A 1-31

CABINET PARTS FOR 26X35, 26X36, 26X37

The above model numbers may contain the suffix "N".

Antenna, Built-in TV.....	A3132
Backing, Cardboard	
for 23D61 picture window.....	43D 102
for 23D61-1 picture window.....	43D 116
Back, Lower TV Compartment.....	43C 101-1
Back, Television Compartment (complete).....	A3106
‡Cabinet (Complete)	
‡Walnut (26X35)	35E 119-1
‡Mahogany (26X36)	35E 119-2
‡Blond (26X37)	35E 119-3
§Door Catch and Strike Plate.....	§
‡Doors, Matched Pair	
‡for Walnut (26X35)	35E 119-50
‡for Mahogany (26X36)	35E 119-51
‡for Blond (26X37)	35E 119-52
Escutcheon, Control (Plastic; less door).....	23D 60-3
Escutcheon Door (Plastic).....	23D 60-2
Gasket, Sponge Rubber	
(40" long, foam rubber, used when picture window requires cardboard backing).....	12A 32-6
(42¼" long, black rubber, used when 23D61 picture window does not require cardboard backing)	12A 5-13
Grille Cloth (2 pieces supplied)	
for Walnut (26X35) and	
Mahogany (26X36)	36B 3-33
for Blond (26X37)	36B 3-34
Grounding Clip (includes 30" braided wire)	
for grounding 23D61 picture window.....	A3229
for grounding 23D61-1 picture window.....	A3232
Handle, Door	37A 23-1
§Hinge, Knife Door.....	§
Jewel, Pilot Light.....	82A 10-8
Knob, Television Tuning	
for "Channel"	33C 53-9
for "Tuning"	33C 53-10
for "Off-Volume"	33C 53-11
for "Picture"	33C 53-12
‡Leg and Base Assy., Cabinet (includes 4 legs)	
‡for Walnut (26X35)	35E 119-53
‡for Mahogany (26X36)	35E 119-54
‡for Blond (26X37)	35E 119-55
Line Cord and Interlock Socket.....	89A 22-1
Screw	
for mounting escutcheon (#4x¾ R.H.W.S.) ..	1A 6-9-57
for mounting back and bumper strip	
(#6x½ R.H.W.S.)	1A 6-24-59
for mounting picture window	
(#6x¾ R.H.W.S.)	1A 6-23-71
for mounting TV chassis (¼-20x1).....	1A 67-43-71
Sheet, Insulating (mounts on cabinet in front of picture tube).....	32D 127
Speaker, 12" PM.....	78B 56-2
Spring, Escutcheon Door	18A 41
Spring, Tuning Knob Tension	
for "Off-Volume" knob	18A 43-2
for "Tuning" knob	18A 43-1
for "Channel" knob	18A 43-3
Spring Clip (for mounting 23D61-1 picture window)	18A 45

Trim, Picture Window (Plastic; 55" long)

Maroon, for Walnut, Mahogany.....	33A 57-1
Beige, for Blond.....	33A 57-4

Washer, Felt

for back of "Channel" knob	5A 4-14
for back of "Picture" knob	5A 4-15

Window, Picture

*with round holes, for mtg. with screws..... *

 with oblong holes, for mtg. with spring clips.. 23D 61-1

If only mounting lug is broken on 23D 61-1 picture window, a new metal lug (part number 15A 668) can be installed with a soldering iron. Instructions (Form S340) included with lugs.

CABINET PARTS FOR 36X35, 36X36, 36X37

Model numbers may contain the suffix "N", "A", or "AN".

Antenna, Built-in TV.....	A3132
Antenna, Built-in FM.....	AB195
Back, Album Compartment.....	43C 118-1
Back, Lower TV Compartment.....	43C 101-1
Back, Record Changer Compartment.....	43C 99
Back, Television Compartment (Complete).....	A3336
Backing, Cardboard	
for 23D61 picture window.....	43C 102
for 23D61-1 picture window.....	43D 116
Bracket, Plug Lock.....	15A 365
‡Cabinet, (Complete)	
‡for Walnut (36X35)	35E 116-1
‡for Mahogany (36X36)	35E 116-2
‡for Blond (36X37)	35E 116-3
Decal, Cabinet Refinishing, for 36X36	
Consists of 2 panel decals and 7 decal strips..	35E 115-61
Decal Cement (1 pint).....	98A 11-3
Door Bumper, Sponge Rubber (1⅞"x1¼"x1")	12A 5-5
‡Door, Cabinet (Radio-Phono and Television Tube Compartment)	
‡Matched pair for Walnut (36X35)	35E 116-58
‡Matched pair for Mahogany (36X36)	35E 116-50
‡Matched pair for Blond (36X37)	35E 116-51
‡Door, Cabinet (Record Compartment)	
‡Complete Door for Walnut (36X35)	35E 116-59
‡Complete Door for Mahogany (36X36)	35E 116-52
‡Complete Door for Blond (36X37)	35E 116-53
‡Door, Cabinet (Television Tuning Compartment)	
‡for Walnut (36X35)	35E 116-60
‡for Mahogany (36X36)	35E 116-54
‡for Blond (36X37)	35E 116-55
§Door Catch and Strike Plate.....	§
Escutcheon, Control (Plastic; less door).....	23D 60-3
Escutcheon Door (Plastic).....	23D 60-2
Escutcheon, Radio	23D 63-1
Gasket, Sponge Rubber	
40" long, foam rubber, used only when picture window requires cardboard backing..	12A 32-6
42¼" long, black rubber, used only when 23D61 picture window does not require cardboard backing	12A 5-13
Grille Cloth (2 pieces supplied)	
for Walnut (36X35), Mahogany (36X36)	36B 3-35
for Blond (36X37)	36B 3-36
Grounding Clip (includes 30" braided wire)	
for grounding 23D 61 picture window.....	A3229
for grounding 23D 61-1 picture window.....	A3232

† To insure proper matching and fit, also specify cabinet manufacturer's code letters (usually burned or stamped on the back rail of cabinet). Wood parts are supplied only if old part cannot be repaired. When ordering describe condition of old part in detail.

§ Order from data given in Cabinet Hinge Ordering Data, Form No. S379. Otherwise, return old part, or send (exact size) tracing of part and note finish (brass, bronze, etc.)

* Not available; replace with 23D61-1 picture window.

Handle, Door	
for Walnut (36X35), Mahogany (36X36).....	37A 26
for Blond (36X37)	37A 26-1
§Hinge, Knife (Pair).....	\$
Jewel, Pilot Light.....	82A 10-8
Knob, Radio Tuning	
“PH-AM-FM”, “Tuning”	33D 55-1
“Off-Volume” (O-shaped knob).....	33D 55-4
“Tone” (I-shaped knob).....	33D 55-5
Knob, Television Tuning	
for “Channel”	33C 53-9
for “Tuning”	33C 53-10
for “Off-Volume”	33C 53-11
for “Picture”	33C 53-12
Line Cord & Interlock Socket.....	89A 22-1
Phono Compartment Light	
See listing under “Parts for Phono Compartment and Pilot Lights”.	
Pilot Light, #47 Mazda.....	81A 1-8
Screw	
for mounting escutcheon (#4x $\frac{3}{8}$ R.H.W.S.) ..	1A 6-9-57
for mounting picture window	
(#6x $\frac{3}{8}$ R.H.W.S.)	1A 6-23-71
for mounting chassis to cabinet.....	1A 67-43-71
Sheet, Insulating (mounts on cabinet in front of picture tube).....	32D 127
Speaker, 12 inch PM.....	78B 56-1
Spring, Escutcheon Door	18A 41
Spring, Tuning Knob Tension	
for “Off-Volume” knob	18A 43-2
for “Tuning” knob	18A 43-1
for “Channel” knob	18A 43-3
Spring Clip (for mounting 23D61-1 picture window)	18A 45
Support Strip Cushion, Television Chassis (on Television chassis support rail)	12A 5-14
Tilt-Out Mechanism	
See listing under “Parts For Tilt-Out Mechanism”.	
Trim, Picture Window (used under 23D61 picture escutcheon only)	
for 36X35 (Walnut), 36X36 (Maroon).....	33A 57-1
for 36X37 (Beige).....	33A 57-4
Washer, Felt	
for back of “Channel” knob	5A 4-14
for back of “Picture” knob	5A 4-15
for back of radio tuning knobs.....	5A 4-11
Window, Picture	
*with round holes, for mtg. with screws.....	*
with oblong holes, for mtg. with spring clips. 23D 61-1	
If only mounting lug is broken on 23D 61-1 picture window, a new metal lug (part number 15A 668) can be installed with a soldering iron. Instructions (Form S340) included with lugs.	

CABINET PARTS FOR 29X15, 29X16, 29X17

The above model numbers may contain the suffix “N”.

Antenna, Built-in “Roto-Scope” TV.....	A3023
Back, Television Compartment (complete).....	A3123
Backing, Cardboard	
for 23E 62-1 picture window.....	43D 119

† To insure proper matching and fit, also specify cabinet manufacturer’s code letters (usually burned or stamped on the back rail of cabinet). Wood parts are supplied only if old part cannot be repaired. When ordering describe condition of old part in detail.

§ Order from data given in Cabinet Hinge Ordering Data, Form No. S379. Otherwise, return old part, or send (exact size) tracing of part and note finish (brass, bronze, etc.)

§§ Not available; replace with 23E62 picture window. If only mounting lug is broken on 23E62-1 picture window, a new metal lug (part number 15A 668) can be installed with a soldering iron. Instructions (Form S340) included with lugs.

* Not available; replace with 23D61-1 picture window.

#Cabinet (Complete)	
#Walnut (29X15)	35E 120-1
#Mahogany (29X16)	35E 120-2
#Blond (29X17)	35E 120-3
§Door Catch and Strike Plate.....	\$
#Doors, Matched Pair	
#for Walnut (29X15)	35E 120-50
#for Mahogany (29X16)	35E 120-51
#for Blond (29X17)	35E 120-52
Escutcheon, Control (Plastic; less door).....	23D 60-3
Escutcheon Door (Plastic).....	23D 60-2
Gasket, Sponge Rubber (for back of picture window)	12A 32-7
Grille Cloth	
for Walnut (29X15) and Mahogany (29X16) ..	36B 3-31
for Blond (29X17)	36B 3-32
Grille, Metal	36C 17-1
Grounding Clip (includes 30" braided wire)	
for grounding 23E62 picture window.....	A3229
for grounding 23E62-1 picture window.....	A3232
Handle, Door	37A 29
§Hinge, Knife Door.....	\$
Knob, Television Tuning	
for “Channel”	33C 53-9
for “Tuning”	33C 53-10
for “Off-Volume”	33C 53-11
for “Picture”	33C 53-12
#Leg, Cabinet	
#for Walnut (29X15)	35E 120-53
#for Mahogany (29X16)	35E 120-54
#for Blond (29X17)	35E 120-55
Line Cord and Interlock Socket.....	89A 22-1
Screw	
for mounting escutcheon (#4x $\frac{3}{8}$ R.H.W.S.) ..	1A 6-9-57
for mounting back and bumper strip	
(#6x $\frac{1}{2}$ R.H.W.S.)	1A 6-24-59
for mounting picture window	
(#6x $\frac{3}{8}$ R.H.W.S.)	1A 6-23-71
for mounting TV chassis ($\frac{1}{4}$ -20x1)	1A 67-43-71
Sheet, Insulating (mounts on cabinet in front of picture tube).....	32D 128
Speaker, 12" PM.....	78B 56-1
Spring, Escutcheon Door	18A 41
Spring, Tuning Knob Tension	
for “Off-Volume” knob	18A 43-2
for “Tuning” knob	18A 43-1
for “Channel” knob	18A 43-3
Spring Clip (for mounting 23E62-1 picture window)	18A 45
Trim, Picture Window (fits under 23E62 Picture Window only)	
Maroon, for 29X15 & 29X16.....	33A 57-2
Beige, for 29X17.....	33A 57-5
Washer, Felt	
for back of “Channel” knob	5A 4-14
for back of “Picture” knob	5A 4-15
Window, Picture	
with round holes, for mtg. with screws.....	23E 62
§§with oblong holes, for mtg. with spring clips. §§	

CABINET PARTS FOR 39X16, 39X16A, 39X17A, 39X16B, 39X17B

The above model numbers may contain the suffix "N".

Antenna, Built-in "Roto-Scope" TV.....	A3023
Antenna, Built-in FM.....	AB211
Back	
for Album Compartment	43C 108-1
for Cabinet (below television compartment) ..	43C 114-1
for Record Changer Compartment.....	43C 107
for Television Compartment (Complete).....	A3194
Backing, Cardboard	
for 23E 62-1 picture window.....	43D 119
Bracket, Slide to Pan Mtg.	
Left side (facing front of cabinet).....	15C 620-1
Right side (facing front of cabinet).....	15C 620-2
Bracket, Changer Stop.....	15A 624
‡Cabinet, (Complete)	
‡for Mahogany (39X16)	35E 122-2
‡for Mahogany (39X16A or B).....	35E 122-5
‡for Blond (39X17A)	35E 122-6
‡for Blond, Toned Mahogany (39X17B).....	35E 122-7
Clamp, Cable	11B 12-6
‡Door, Cabinet	
‡Matched set of 3 doors for Mahogany (39X16 and 39X16A or B).....	35E 122-51
‡Matched set of 3 doors for Blond (39X17A) ..	35E 122-52
‡Matched set of 3 doors for Blond, Toned Mahogany (39X17B)	35E 122-61
§Door Catch and Strike Plate.....	§
Door Handle	37A 28
Escutcheon, Control (less door)	
with "I" shaped slot, for flat door spring.....	23D 60-3
with "U" shaped slot, for coil door spring.....	23D 60-6
Escutcheon, Door	
used with 23D 60-3 escutcheon (mounts with flat door spring).....	23D 60-2
used with 23D 60-6 escutcheon (mounts with coil door spring).....	23D 60-7
Escutcheon, Radio	23D 63-1
Gasket, Sponge Rubber (for picture window)...	12A 32-7
Grille Cloth (2 pieces)	
for Mahogany (39X16 and 39X16A or B)	36B 3-39
for Blond (39X17A or B).....	36B 3-40
Grille, Metal	36C 18-1
Grounding Clip (includes 30" braided wire)	
for grounding 23D 61 picture window.....	A3229
for grounding 23D 61-1 picture window	A3232
§Hinge, Knife (pair).....	§
Jewel, Pilot Light (green).....	82A 10-8
Knob, for Slide-Out Shelf Assembly (39X16 only)	33A 41-2
Knob, Radio Tuning	
"PH-AM-FM", "Tuning"	33D 55-1
"Off-Volume" (O-shaped knob).....	33D 55-4
" Tone" (I-shaped knob).....	33D 55-5
Knob, Television Tuning	
for "Channel"	33C 53-9
for "Tuning"	33C 53-10
for "Off-Volume"	33C 53-11
for "Picture"	33C 53-12
‡Leg, Cabinet	
‡for Mahogany (39X16 and 39X16A or B)....	35E 122-54
‡for Blond (39X17A)	35E 122-55
‡for Blond, Toned Mahogany (39X17B).....	35E 122-62

† To insure proper matching and fit, also specify cabinet manufacturer's code letters (usually burned or stamped on the back rail of cabinet). Wood parts are supplied only if old part cannot be repaired. When ordering describe condition of old part in detail.

§ Order from data given in Cabinet Hinge Ordering Data, Form No. S379. Otherwise, return old part, or send (exact size) tracing of part and note finish (brass, bronze, etc.)

§§ Not available; replace with 23E62 picture window. If only mounting lug is broken on 23E 62-1 picture window, a new metal lug (part number 15A 668) can be installed with a soldering iron. Instructions (Form S340) included with lugs.

Line Cord & Interlock Socket..... 89A 22-1

Phono Compartment Light

See listing under "Parts for Phono Compartment and Pilot Lights".

Pilot Light, #47..... 81A 1-8

Pull, Record Changer Slide (not used on 39X16) . 37A 31

Rod, Wooden Dowel (Antenna Mtg.)..... 46A 4-7

Screw

 for mounting escutcheon (#4x $\frac{3}{8}$ R.H.W.S.) .. 1A 6-9-57

 for mounting back and bumper strip

 (#6x $\frac{1}{2}$ R.H.W.S.) 1A 6-24-59 |

for mounting picture window

(#6x $\frac{3}{8}$ R.H.W.S.) 1A 6-23-71 |

for mounting radio-phono assembly to wooden

slide shelf (#8x1 $\frac{1}{4}$ H. Hd. S.T.)..... 1A 51-21-71 |

for mounting TV chassis ($\frac{1}{4}$ ·20x1)..... 1A 67-44-71 |

for mounting slide-out bracket to slide

(#6·32x $\frac{3}{8}$ F.H.M.S.) 361-375-C2-71 |

Sheet, Insulating (mounts on cabinet in front

of picture tube)..... 32D 128 |

Shelf, Slide Out (for Mahogany (39X16)..... 35E 122-57 |

Slide, Drawer (not used on 39X16)..... 37B 32-2 |

Speaker, 12 inch PM..... 78B 55-1 |

Speed Nut (for mounting radio escutcheon).... 2B 10-24-59 |

Spring Clip, (for mounting 23E 62-1 picture

window) 18A 45 |

Spring, Escutcheon Door

flat (bronze) spring (used with 23D 60-3 escutcheon)

for left or right hinge..... 18A 41 |

coil (wire) spring (used with 23D 60-6 escutcheon)

for left hinge (facing front)..... 19A 65-2 |

for right hinge (facing front)..... 19A 65-1 |

Spring, Slide Tension (not used on 39X16)..... 18A 46 |

Spring, Tuning Knob Tension

for "Off-Volume" knob 18A 43-2 |

for "Tuning" knob 18A 43-1 |

for "Channel" knob 18A 43-3 |

Support Strip Cushion, Television Chassis

(on Television chassis support rail)..... 12A 5-14 |

Trim, Picture Window (used with 23E 62

picture window only)

maroon, for Mahogany (39X16 and

39X16A or B)..... 33A 57-2 |

beige, for Blond (39X17A or B)..... 33A 57-5 |

Washer, Felt

for back of "Channel" knob 5A 4-14 |

for back of "Picture" knob 5A 4-15 |

for back of radio tuning knobs..... 5A 4-11 |

Window, Picture

with round holes, for mtg. with screws..... 23E 62 |

§§with oblong holes, for mtg. with spring clips. §§

CABINET PARTS FOR 26R25, 26R26, 26R35, 26R36, 26R37, 26X45, 26X46

The above model numbers may contain the suffix "N".

Antenna, Built-in TV

for 26R25, 26R26, 26R35, 26R36, 26R37..... A3091 |

for 26X45, 26X46 A3029 |

Back, Cabinet (Complete)

for 26R25, 26R26, 26R35, 26R36, 26R37..... A3337 |

for 26X45, 26X46 A3338 |

‡Cabinet, Wood	
‡Walnut (26R25)	35E 126-1
‡Mahogany (26R26)	35E 126-2
‡Walnut (26R35)	35E 125-1
‡Mahogany (26R36)	35E 125-2
‡Blond (26R37)	35E 125-3
‡Walnut (26X45)	35E 110-1
‡Mahogany (26X46)	35E 110-2
‡Door, Cabinet	
‡matched pair for Walnut (26R25)	36E 126-50
‡matched pair for Mahogany (26R26)	36E 126-51
‡matched pair for Walnut (26R35)	35E 125-50
‡matched pair for Mahogany (26R36)	35E 125-51
‡matched pair for Blond (26R37)	35E 125-52
§Door Catch and Strike Plate.....	§
Escutcheon, Control (Plastic; less door).....	23D 60-1
Escutcheon Door, (Plastic).....	23D 60-4
Gasket, Sponge Rubber (includes chipboard back for picture window)	12A 32-6
Grille Cloth	
for Walnut (26R25), Mahogany (26R26).....	36B 3-41
for Walnut (26R35), Mahogany (26R36).....	36B 3-33
for Blond (26R37)	36B 3-34
for Walnut (26X45), Mahogany (26X46).....	36B 3-24
Handle, Door	
for Walnut (26R25), Mahog. (26R26).....	37A 34
for Walnut (26R35), Mahog. (26R36), Blond (26R37)	37A 30
§Hinge, Knife Door.....	§
Knob, Television Tuning	
for "Channel"	33C 53-9
for "Tuning"	33C 53-10
for "Off-Volume"	33C 53-11
for "Picture"	33C 53-12
Line Cord and Interlock Socket.....	89A 22-1
Screw	
for mtg. escutcheon (#4x $\frac{3}{8}$ R.H.W.S.).....	1A 7-9-57
for mtg. back (#6x $\frac{1}{2}$ R.H.W.S.).....	1A 6-24-71
for mtg. picture window (#6x $\frac{3}{8}$ R.H.W.S.)..	1A 6-23-71
for mtg. TV chassis ($\frac{1}{4}$ -20x1).....	1A 67-43-71
Speaker, 10" PM.....	78B 47-1
Spring, Escutcheon Door	18A 41
Spring, Tuning Knob Tension	
for "Off-Volume" knob	18A 43-2
for "Tuning" knob	18A 43-1
for "Channel" knob	18A 43-3
Spring Clip (for mtg. 23D67 pic. window).....	18A 45
Washer, Felt	
for back of "Channel" knob	5A 4-14
for back of "Picture" knob	5A 4-15
Window, Picture	23D 67
(Early production sets may have window used with plastic trim. Later production window used without plastic trim, is supplied for replacement.)	
If only mounting lug is broken on picture window, a new metal lug (part number 15A 668) can be installed with a soldering iron. Instructions (Form S340) included with lugs.	

‡ To insure proper matching and fit, also specify cabinet manufacturer's code letters (usually burned or stamped on the back rail of cabinet). Wood parts are supplied only if old part cannot be repaired. When ordering describe condition of old part in detail.

§ Order from data given in Cabinet Hinge Ordering Data, Form No. S379. Otherwise, return old part, or send (exact size) tracing of part and note finish (brass, bronze, etc.)

CABINET PARTS FOR 39X25, 39X26

The above model numbers may contain the suffix "N".

Antenna	
Built-in TV	A3023
Built-in FM	AB211
Back, Cabinet	
Album Compartment	43C 108-2
Record Changer Compartment.....	43C 107-1
TV Compartment (Complete).....	A3194
for below TV compartment.....	43C 114-2
Backing, Cardboard	
for 23E62-1 picture window.....	43D 119
Bracket, Plug Lock.....	15A 365
‡Cabinet	
‡for Walnut (39X25)	35E 129-1
‡for Mahogany (39X26)	35E 129-2
Decal, Cabinet Refinishing (Set of 5 strips)	
for Walnut (39X25)	35E 129-65
for Mahogany (39X26)	35E 129-66
Decal Cement (1 pint).....	98A 11-3
‡Door, Cabinet (Radio-Phono and Television Tube Compartment)	
‡Matched pair for Walnut (39X25)	35E 129-50
‡Matched pair for Mahogany (39X26)	35E 129-51
‡Door, Cabinet (Record Compartment)	
‡Complete Door for Walnut (39X25)	35E 129-53
‡Complete Door for Mahogany (39X26)	35E 129-54
‡Door, Cabinet (Television Tuning Compartment)	
‡for Walnut (39X25)	35E 129-62
‡for Mahogany (39X26)	35E 129-63
§Door Catch and Strike Plate.....	§
Escutcheon, Control (less door)	
with "I" shaped slot, for flat door spring.....	23D 60-3
with "U" shaped slot, for coil door spring....	23D 60-6
Escutcheon, Door	
used with 23D 60-3 escutcheon (mounts with flat door spring).....	23D 60-2
used with 23D 60-6 escutcheon (mounts with coil door spring)	23D 60-7
Escutcheon, Radio	23D 63-1
Gasket, Sponge Rubber (52" long, for picture window)	12A 32-6
Grille Cloth (2 pieces supplied)	36C 3-45
Grounding Clip (includes 30" braided wire)	
for grounding 23E62 picture window	A3229
for grounding 23E62-1 picture window	A3232
Handle, Door	37A 25-1
§Hinge, Knife (pair).....	§
Jewel, Pilot Light.....	82A 10-8
Knob, Radio Tuning	
"PH-AM-FM", "Tuning"	33D 55-1
"Off-Volume"	33D 55-4
"Tone"	33D 55-5
Knob, Television Tuning	
"Channel"	33C 53-9
"Tuning"	33C 53-10
"Off-Volume"	33C 53-11
"Picture"	33C 53-12
Line Cord & Interlock Socket.....	89A 22-1
Phono Compartment Light, See "Parts for Phono Compartment and Pilot Lights".	
Pilot Light, #47 Mazda.....	81A 1-8
Screw	
for control escutcheon (#4x $\frac{3}{8}$ R.H.W.S.)....	1A 7-9-57
for picture window (#6x $\frac{3}{8}$ R.H.W.S.).....	1A 6-23-71
for mounting TV chassis.....	1A 67-43-71

for control escutcheon (#4x $\frac{3}{8}$ R.H.W.S.).... 1A 7-9-57

for picture window (#6x $\frac{3}{8}$ R.H.W.S.)..... 1A 6-23-71

for mounting TV chassis..... 1A 67-43-71

Sheet, Insulating (mounts on cabinet in front of picture tube).....	32D 128
Speaker, 12 inch PM.....	78B 56-1
Spring, Escutcheon Door	
flat (bronze) spring (used with 23D 60-3 escutcheon) for left or right hinge.....	18A 41
coil (wire) spring (used with 23D 60-6 escutcheon) for left hinge (facing front).....	19A 65-2
for right hinge (facing front).....	19A 65-1
Spring, TV Knob Tension	
for "Off-Volume" knob	18A 43-2
for "Tuning" knob	18A 43-1
for "Channel" knob	18A 43-3
Spring Clip, for mtg. 23E62-1 picture window....	18A 45
Support Strip Cushion, Television Chassis (on Television chassis support rail)	12A 5-14
Tilt-Out Parts, See "Parts For Tilt-Out Mechanism".	
Trim, Picture Window (plastic, 62")	33A 57-2
Washer, Felt	
used behind "Channel" knob	5A 4-14
used behind "Picture" knob	5A 4-15
used behind radio tuning knobs.....	5A 4-11
Window, Picture	
with round holes, for mtg. with screws.....	23E 62
§§with oblong holes, for mtg. with spring clips. §§	

CABINET PARTS FOR 26X55, 26X56, 26X57, 26X65, 26X66, 26X67, 26X75, 26X76

This parts list does not apply to models in this group having the suffix letter "A" or "AN", but it does apply if the model number has the suffix letter "N" only.

Antenna, Built-in TV.....	A3132
Backing, Cardboard	
for 23D61 picture window.....	43D 102
for 23D61-1 picture window.....	43D 116
Back, Lower TV Compartment.....	43C 101-3
Back, Television Compartment (complete)	A3337
‡Cabinet, Wood	
‡Walnut (26X55)	35E 130-1
‡Mahogany (26X56)	35E 130-2
‡Blond (26X57)	35E 130-3
‡Walnut (26X65)	35E 131-1
‡Mahogany (26X66)	35E 131-2
‡Blond (26X67)	35E 131-3
‡Walnut (26X75)	35E 132-1
‡Mahogany (26X76)	35E 132-2
‡Cabinet Legs (includes cross rails)	
‡Walnut (26X65)	35E 131-53
‡Mahogany (26X66)	35E 131-54
‡Blond (26X67)	35E 131-55
‡Walnut (26X75)	35E 132-56
‡Mahogany (26X76)	35E 132-57
‡Doors, Matched Pair	
‡Walnut (26X65)	35E 131-50
‡Mahogany (26X66)	35E 131-51
‡Blond (26X67)	35E 131-52
‡Walnut (26X75)	35E 132-50
‡Mahogany (26X76)	35E 132-51
§Door Catch and Strike Plate.....	§
Escutcheon, Control (Plastic; less door)	23D 60-3
Escutcheon Door (Plastic)	23D 60-2

‡ To insure proper matching and fit, also specify cabinet manufacturer's code letters (usually burned or stamped on the back rail of cabinet). Wood parts are supplied only if old part cannot be repaired. When ordering describe condition of old part in detail.

§ Order from data given in Cabinet Hinge Ordering Data, Form No. S379. Otherwise, return old part, or send (exact size) tracing of part and note finish (brass, bronze, etc.)

§§ Not available; replace with 23E62 picture window. If only mounting lug is broken on 23E62-1 picture window, a new metal lug (part number 15A 668) can be installed with a soldering iron. Instructions (Form S340) included with lugs.

* Not available; replace with 23D61-1 picture window.

Gasket, Sponge Rubber	
(40" long, used with picture window)	12A 32-6
Grille, Metal	
for Walnut (26X65), Mahog. (26X66),	
Blond (26X67)	36A 7-11
Grille Cloth	
for Walnut (26X55), Mahog. (26X56)	36B 3-49
for Blond (26X57)	36B 3-50
for Walnut (26X65), Mahog. (26X66)	36B 3-47
for Blond (26X67)	36B 3-48
for Walnut (26X75), Mahog. (26X76)	36B 3-41
Grounding Clip (includes 30" braided wire)	
for grounding 23D61 picture window.....	A3229
for grounding 23D61-1 picture window.....	A3232
Handle, Door	
for Walnut (26X65), Mahog. (26X66),	
Blond (26X67)	37A 30-1
pair for Walnut (26X75), Mahog. (26X76) ...	37A 34
§Hinge, Knife	§
Knob, Television Tuning	
"Channel"	33C 53-9
"Tuning"	33C 53-10
"Off-Volume"	33C 53-11
"Picture"	33C 53-12
Line Cord and Interlock Socket.....	89A 22-1
Screw	
for control escutcheon (#4x $\frac{3}{8}$ R.H.W.S.)	1A 7-9-57
for mounting back and bumper strip	
(#6x $\frac{1}{2}$ R.H.W.S.)	1A 6-24-59
for picture window (#6x $\frac{1}{2}$ R.H.W.S.)	1A 22-8-71
for mounting TV chassis ($\frac{1}{4}$ -20x1)	1A 67-43-71
Sheet, Insulating (mounts on cabinet in front of picture tube).....	32D 127
Speaker, 10" PM.....	78B 47-1
Spring, Escutcheon Door	18A 41
Spring, TV Knob Tension	
for "Off-Volume" knob	18A 43-2
for "Tuning" knob	18A 43-1
for "Channel" knob	18A 43-3
Spring Clip (for mounting 23D61-1 picture window)	18A 45
Trim, Picture Window (Plastic; 55" long)	
Maroon, for Walnut, Mahog.	33A 57-1
Beige, for Blond.....	33A 57-4
Washer, Felt	
used behind "Channel" knob	5A 4-14
used behind "Picture" knob	5A 4-15
Window, Picture	
* with round holes, for mounting with screws... *	
with oblong holes, for mtg. with spring clips. 23D 61-1	
CABINET PARTS FOR 29X25, 29X26, 29X27	
The above model numbers may contain the suffix "N".	
Antenna, Built-in TV.....	A3023
Backing, Cardboard	
for 23E62-1 picture window.....	43D 119
Back, Cabinet (complete)	A3123
‡Cabinet (Complete)	
‡Walnut (29X25)	35E 133-1
‡Mahogany (29X26)	35E 133-2
‡Blond (29X27)	35E 133-3
Decal, Matched Set, for doors	
Walnut (29X25)	35E 133-63
Mahogany (29X26)	35E 133-64
§Door Catch and Strike Plate.....	§

‡Doors, Matched Pair	
‡for Walnut (29X25)	35E 133-50
‡for Mahogany (29X26)	35E 133-51
‡for Blond (29X27)	35E 133-52
Escutcheon, Control (less door)	
with "I" shaped slot, for flat door spring.....	23D 60-3
with "U" shaped slot, for coil door spring....	23D 60-6
Escutcheon, Door	
used with 23D 60-3 escutcheon (mounts	
with flat door spring)	23D 60-2
used with 23D 60-6 escutcheon (mounts	
with coil door spring)	23D 60-7
Gasket, Sponge Rubber (52", for picture	
window)	12A 32-7
Grille, Wood	
for Walnut (29X25)	35E 133-53
for Mahogany (29X26)	35E 133-54
for Blond (29X27)	35E 133-55
Grille Cloth	
for Walnut (29X25), Mahog. (29X26)	36B 3-42
for Blond (29X27)	36B 3-43
Grounding Clip (includes 30" braided wire)	
for grounding 23E62 picture window.....	A3229
for grounding 23E62-1 picture window.....	A3232
Handle, Door	37A 25-1
§Hinge, Knife Door.....	§
Knob, Television Tuning	
"Channel"	33C 53-9
"Tuning"	33C 53-10
"Off-Volume"	33C 53-11
"Picture"	33C 53-12
‡Leg and Base Assembly, Cabinet	
‡for Walnut (29X25)	35E 133-59
‡for Mahogany (29X26)	35E 133-60
‡for Blond (29X27)	35E 133-61

* To insure proper matching and fit, also specify cabinet manufacturer's code letters (usually burned or stamped on the back rail of cabinet). Wood parts are supplied only if old part cannot be repaired. When ordering describe condition of old part in detail.

§ Order from data given in Cabinet Hinge Ordering Data, Form No. S379. Otherwise, return old part, or send (exact size) tracing of part and note finish (brass, bronze, etc.)

§§ Not available; replace with 23E62 picture window. If only mounting lug is broken on 23E62-1 picture window, a new metal lug (part number 15A 668) can be installed with a soldering iron. Instructions (Form S340) included with lugs.

Line Cord and Interlock Socket.....	89A 22-1
Rosette, for grille.....	35E 133-62
Screw	
for mounting escutcheon (#4x $\frac{3}{8}$ R.H.W.S.) ..	1A 6-9-57
for mounting back and bumper strip	
(#6x $\frac{1}{2}$ R.H.W.S.)	1A 6-24-59
for mounting picture window	
(#6x $\frac{3}{8}$ R.H.W.S.)	1A 6-23-71
for mounting TV chassis ($\frac{1}{4}$ -20x1)	1A 67-43-71
Sheet, Insulating (mounts on cabinet in front	
of picture tube)	32D 128
Speaker, 12" PM.....	78B 56-1
Spring, Escutcheon Door	
flat (bronze) spring (used with 23D 60-3 escutcheon)	
for left or right hinge.....	18A 41
coil (wire) spring (used with 23D 60-6 escutcheon)	
for left hinge (facing front)	19A 65-2
for right hinge (facing front)	19A 65-1
Spring, TV Knob Tension	
for "Off-Volume" knob	18A 43-2
for "Tuning" knob	18A 43-1
for "Channel" knob	18A 43-3
Spring Clip (for mounting 23E62-1	
picture window)	18A 45
Trim, Picture Window (Plastic, 62" long)	
Maroon, for Walnut, Mahogany.....	33A 57-2
Beige, for Blond.....	33A 57-5
Washer, Felt	
used behind "Channel" knob	5A 4-14
used behind "Picture" knob	5A 4-15
Window, Picture	
with round holes, for mtg. with screws.....	23E 62
§§with oblong holes, for mtg. with spring clips. §§	

94C18-3 TELEVISION TUNER SERVICE

GENERAL

The 94C18-3 tuner is a sub-chassis consisting of an RF amplifier stage and a mixer-oscillator stage.

Three different RF amplifier tubes, either 6AG5, 6BC5, or 6CB6, are used in this tuner. Although these tubes have similar characteristics and are generally interchangeable, it is advisable to check the RF amplifier curve with a sweep generator and oscilloscope after replacement. A dual triode 6J6 tube is used in the mixer-oscillator stage.

Channel selection is accomplished by rotation of the tuner turret assembly, which has a separate set of two coils for each of the 12 television channels. Each set consists of an antenna coil in one assembly, and a mixer-oscillator coil in another. Coils are the snap-in type. Coils can be identified as to channel by the number stamped on the outside of the coil assembly. A Tuning control, having a tuning range of plus or minus 1.5 MC for low channels, and plus or minus 3 MC for high channels, permits fine adjustment of oscillator frequency.

The high frequencies used in television make it necessary that extreme care be exercised in handling or servicing tuners.

Location and lead dress of components and wiring are

usually very critical. Wiring leads, acting as small inductances or capacities, may appreciably alter electrical characteristics of critical circuits at high frequencies.

Parts location and ground connections should be as originally made. When replacing components, *it is important that they be replaced with parts of identical electrical characteristics and physical size.* Refer to parts list for temperature coefficients, tolerances, and other essential description.

Note resemblance between some ceramic condensers and resistors. If in doubt, check Schematic and Parts List.

Also note that replacement of tubes (especially 6J6 oscillator-mixer tube) may cause some slight detuning of tuner circuits. This is due to the inherent differences of inter-electrode capacitances. When replacing 6J6 tube, it is recommended that several tubes be tried in order to select a tube which will cause least oscillator frequency shift. This is easily checked by noting whether the Tuning control will tune in the television signal at, or reasonably close to, the middle of its range. See page 5 for Oscillator Adjustment using television signal.

Channel snap-in coils must be handled with care. Do

not disturb coil windings. Also be sure the coils are properly paired for the indicated channel number, and that coils follow proper sequence when reassembled in the turret drum. For proper reference of tuner shaft in relation to coil position, refer to figure 25.

TUNER REPLACEMENT

Replacement of the complete tuner should generally never become necessary since electrical and mechanical parts are easily replaceable.

INTERMITTENT PICTURE AND SOUND

This trouble is most commonly due to an intermittent tube, loose tube socket contacts, dirty or loose coil contacts, loose or cold (rosin) soldered joints, or loose or vibrating components in the underside of the tuner chassis.

If a bad tube is the cause of trouble, replace with one known to be good, see tube note under "Sound Bars In Picture".

Loose tube socket contacts may sometimes be tightened by compressing contacts with an ice pick or a large needle. Defective tube socket contacts can sometimes be replaced individually.

For cleaning and adjusting coil contacts, see paragraphs "Cleaning Contacts" and "Adjusting Contact Springs".

Loose or intermittent connections can be found by tapping components or rotating the channel selector and watching the pattern on an oscilloscope. A visual inspection or a continuity check will also be helpful.

Apply a hot soldering iron to soldered joints which appear doubtful. Caution: Do not change lead lengths or move components other than to slightly separate parts or leads which have caused trouble by contact with the chassis or other parts. See discussion in paragraph "General".

SOUND BARS IN PICTURE (DUE TO MICROPHONICS)

Microphonics in this receiver will generally show up as sound bars as the volume is turned up or as the chassis or cabinet is tapped lightly.

Check for microphonic oscillator mixer tube, V102 (6J6). It is recommended that several tubes be tried, in order to select a tube which will be least microphonic and at the same time, causes a minimum of oscillator frequency shift, as noted with rotation of Tuning control. In some cases, replacement of the oscillator mixer tube, may necessitate readjustment of the overall oscillator adjustment (A15). Refer to page 17.

Also, check for any mechanical "rub" such as loose screws which hold the tuner sub-chassis to the main chassis, loose solder connection from tube shield base to chassis, or extremely dry tuner shaft.

TUNING CONTROL

The Tuning control is a variable dielectric type condenser. The normal tuning range of the Tuning control for high channels is plus or minus 3 MC, for low channels plus or minus 1.5 MC.

Slight rubbing of the dielectric rotor of M104 against the grounded stator plate M107 is intentional, in order

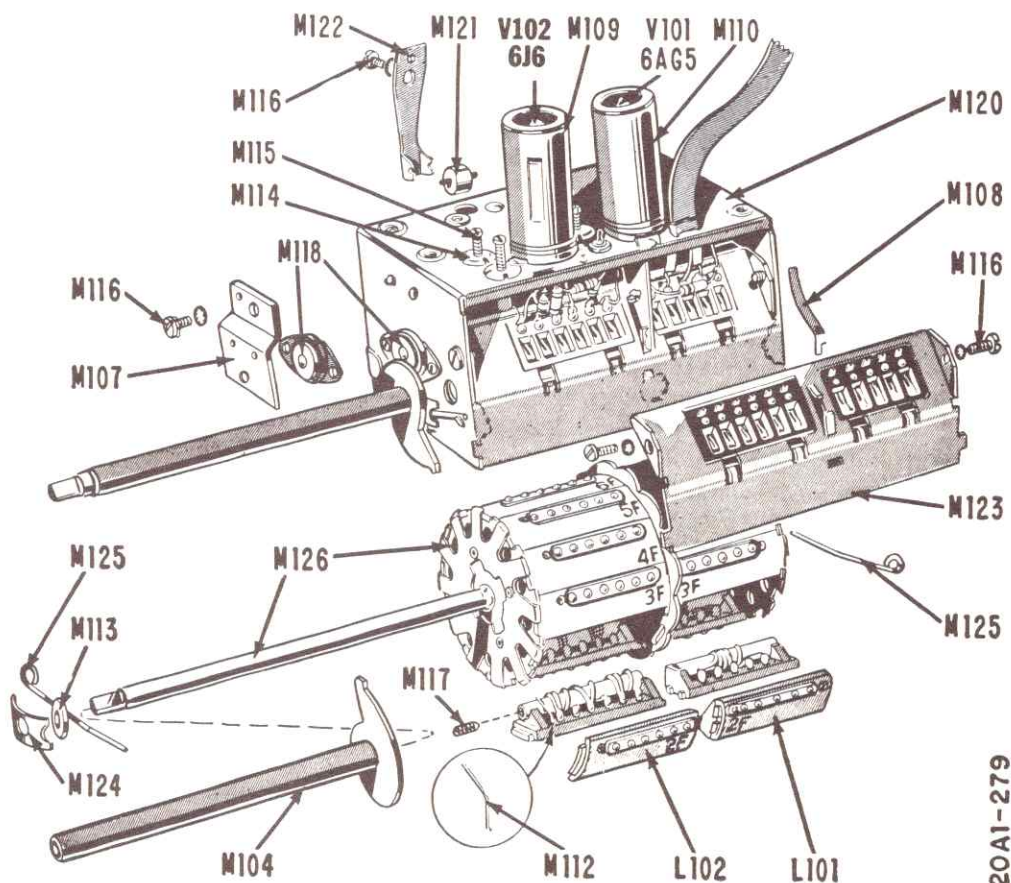


Figure 27. Exploded View, 94C18-3 Tuner. (For description of parts see page 23.)

20A1-279

to avoid vibration with resulting microphonics. However the dielectric rotor should not be allowed to contact the circular disc riveted to the body of the tuner.

The Tuning control is permanently set at the factory and cannot be readjusted for frequency tuning range.

Tuning Control Difficult To Turn. If the Tuning control binds and is hard to turn even after the chassis is removed from the cabinet, loosen the screws holding the triangle-shaped bakelite bearing plate at the front of the chassis and try shifting the plate.

REMOVING CHANNEL COILS

Insert a screwdriver blade between the coil retainer spring and the turret end plate. Twist the blade away from the turret and lift the end of the coil upward and remove.

CLEANING CONTACTS

Remove several sets of coils from turret and rotate turret to position making contact points of contact plate accessible for cleaning.

Using a small, stiff brush and carbon tetrachloride, clean contact surfaces of stationary contacts.

Remove accumulated dust or grease from stationary contacts and contact plate with a soft canvas cloth dampened with carbon tetrachloride. Accumulated rosin may be removed with a soft cloth dampened with denatured alcohol.

Clean contact surfaces of rotating coils in same manner.

TUNER LUBRICATION

In general the lubrication applied to points of wear or friction at time of manufacture should make lubrication seldom, if ever necessary. However, should tuner lubrication become necessary, it is important that the correct amount and type of lubricant be used.

Using a clean brush, apply a film of switch contact oil (Admiral part number 98A64-1 or Viscosity Oil Co. #7069) to the surfaces of the coil contacts and stationary contact points.

Lubricate bearing surfaces of all other moving parts with light vaseline or preferably Admiral part #98A64-2 or Viscosity Oil Co. #8857 lubricant.

CAUTION: *Do not use lubriplate or any similar lubricant containing zinc or cadmium.*

ADJUSTING CONTACT SPRINGS

Should the stationary contact springs make poor contact due to insufficient tension, remove several sets of coils from the turret. Rotate the turret to position making the bottom of the contact strip accessible for observation. With a narrow blade screwdriver, adjust the contact spring tension by carefully bending the spring inward until highest point on the spring extends about 9/64 of an inch above the plastic surface of the contact plate. With correct tension of the contact spring, the spring should clear the flat surface of the turret coil by about 1/64 of an inch.

OSCILLATOR SLUGS IN TOO FAR

If HF oscillator slugs "fall into" coil form, remove the channel coil, move the slug retaining spring M112 aside, and tap the coil assembly until the slug slips forward. Set the coil retaining spring into position; it should rest firmly against the slug.

REMOVING TUNER TURRET ASSEMBLY

- Remove retaining bracket M107 in front of the tuner.
- Remove rotor shaft assembly M104, rotor contact spring M124 and fibre washer M113. For reassembly, note order of parts removal.
- Remove front and rear turret retaining springs M125 by depressing straight end of spring from tab on chassis.
- Using a screwdriver blade at the side of the tuner, press the detent spring M122 and roller M121 away from the turret detent plate.
- Grasp tuner shaft and slip out of end plate bearings.

REPLACEMENT OF THE UNGROUNDED STATOR PLATE OF TUNING CONTROL

Stator plate M118 (part number 94A45-86) is replaced with wiring lead and trimmer condenser C110 attached, because it is difficult to solder the wire lead to the silver plated surface on the ceramic stator plate disc.

To replace the stator plate, remove the turret assembly. Remove mounting rivets from stator plate by drilling out or clipping them out with diagonal wire cutters. Remove trimmer screw M115 and locking nut M114 from trimmer condenser C110. Unsolder wiring lead connecting trimmer to terminal on contact plate.

Assemble the replacement stator plate (M118) by placing the ceramic button over the $\frac{5}{8}$ " hole in the chassis with the wiring lead extending into the chassis. Place the mounting bracket over the ceramic button and mount securely using #4x $\frac{3}{16}$ round head machine screws with #4-40x $\frac{3}{16}$ hex nuts and #4 shake proof lock washers. Mount trimmer condenser C110 in chassis and solder wire lead to its original terminal on the contact plate, making this lead as short as possible. Dress wiring lead from ceramic stator plate to trimmer condenser C110 so it does not come in contact with the turret drum. After replacement of the stator plate, it will be necessary to make the overall oscillator adjustment A15 (page 17).

REMOVING CONTACT PLATE ASSEMBLY M123

- Remove turret.
- Remove the mounting screws at the front and rear of Contact Plate and Bracket Assembly M123.
- Unsolder both ends of contact plate assembly. Press outward the front and rear tuner chassis end plates.
- To free contact plate assembly, release the contact plate tabs by pushing them away from the slots in the end plates.
- Unsolder all connections to contact plate. Unsolder the solder joint holding contact plate to the center partition of the tuner chassis.
- Reassemble in the same manner.

PICTURE TUBE REPLACEMENT

Important: After replacing any picture tube, be sure to make all deflection adjustments—Picture Centering, Deflection Yoke, and Ion Trap—as given on page 6. Especially note comments on picture centering.

WARNING: Because of the high 2nd anode voltage used (approximately 13KV) and the possibility of danger of implosion due to high vacuum, the following precautions should be noted when removing or replacing picture tubes:

- Before handling a picture tube, remove the 2nd anode static charge from both the picture tube and the 2nd anode connector by shorting them to chassis.
- Always handle the picture tube very carefully. DO NOT pick the tube up by the neck.
- In round tubes, keep the glass portion between the metal cone and the tube neck free from moisture or grease (such as natural body oils from finger marks). Arcing may result between metal cone and mounting bracket.

The 16-inch picture tubes are easily removed after the chassis has been removed from the cabinet. In sets using 19-inch picture tubes, it is necessary to remove both the chassis and the tube mounting board assembly.

Rectangular tubes can be removed from the chassis in a conventional manner.

To remove round tubes, first loosen the four screws which hold the picture tube and focus coil top mounting bracket to the lower mounting bracket. Then the picture tube and polyethylene ring can be lifted over the front mounting bracket.

When replacing round tubes, use the following step by step procedure:

- a. Prepare the tube for mounting by slipping the cone-shaped polyethylene sheet over the picture tube.

(This sheet is not used in later sets). Fit the polyethylene ring over the edge of the cone-shaped sheet and the picture tube outer ring. The splice in the polyethylene ring should come together so that it lines up with the key in the picture tube base (pins should be up so that picture tube socket leads will reach).

- b. The four mounting screws which hold the picture tube and focus coil top mounting bracket to the lower mounting bracket should be loose so that the top mounting bracket is free to tip backward.
- c. Insert the picture tube neck through the deflection yoke and focus coil and lift the front of the tube over the front mounting bracket so that the bracket fits into the center of the polyethylene ring. Be sure that the splice in the ring (and the key in the tube base) are facing upward. If set has a polyethylene cone, see that the polyethylene cone fits OVER the rubber collar at the tube neck and is not held by the rubber collar.
- d. Place the 2nd anode contact spring over the metal rim of the tube between $\frac{1}{4}$ and $\frac{1}{2}$ the distance from the top of the tube (to the left on 16-inch tubes and to the right on 19-inch tubes). Close the polyethylene ring splice. Reinstall the picture tube mounting rod and tighten the screws.
- e. Push the picture tube and focus coil top mounting bracket as far forward as possible and tighten the four mounting screws. Slip the ion trap over the tube base with the magnet down and the blue sleeve to the left.
- f. Make all deflection adjustments; see page 6.

SERVICE HINTS

For additional information, see "Trouble Shooting", "Production Changes" and page 50.

The circuits in the 24D1, 24E1, 24F1, 24G1, 24H1 chassis are very similar to those in the late production 20A1, 20B1, 21A1 chassis. Most service techniques applicable to the 20A1, 20B1, 21A1 chassis can be used when servicing the 24D1, 24E1, 24F1, 24G1, 24H1 chassis.

SWITCHING IN COMBINATION MODELS

If the television and radio are turned on at the same time, neither unit will operate. For details, see "Switching In Combination Models" on page 13.

SERVICING TV AND RADIO SEPARATELY

See discussion on schematic page.

TV TUNER SERVICE

See discussion on pages 29, 30, 31.

AUTOMATIC GAIN CONTROL CIRCUIT

A "triggered" type AGC circuit is employed to develop a rapidly changing bias which is applied to the RF Amplifier and the 1st and 2nd video IF amplifiers with any sudden change in the sync level input to the receiver. Since the sound IF signal is taken from the output of the 1st video IF amplifier, failure of the AGC circuit will also affect the sound. If the video amplifier V306 (6AC7) becomes defective, the AGC system will develop enough negative bias to cut-off the AGC controlled tubes. This results in loss of both sound and picture. If the AGC becomes completely inoperative, such as a defective AGC tube, the sound level will increase due to loss of control bias on the 1st IF amplifier. Also, this condition will generally result in loss of picture since the detected voltage developed across resistor

R314 is large enough to cut off the video amplifier V306.

The most positive way to check for proper operation of the AGC circuit is to observe the control grid and plate voltage waveforms. See TP3 and TP4 under "Waveform Analysis".

INSUFFICIENT WIDTH AND HEIGHT

Since the plate voltage on the vertical oscillator and vertical output tubes is received from the boosted B+ supply (boot strap), any failure in the horizontal oscillator or horizontal output stages (such as a bad 6CD6 tube) will also affect picture height and vertical linearity.

IMPROVING TELEVISION SENSITIVITY IN COMBINATION MODELS USING 5B2 RADIO

If the PH-AM-FM switch SW601 on the 5B2 radio is left in the PH or AM position, all stages (in the television set) receiving plate voltage from the low voltage power supply are shunted by a 7500 ohm resistor R621 in the radio. Plate voltage, and thus sensitivity, are slightly reduced. In areas where the TV signal is relatively weak, it is advisable to place this switch in the FM position when using the television receiver.

This condition does not apply to the 5D2 radio.

ARCING OR CORONA DISCHARGE

Arcing or corona in the 2nd anode supply circuit of the picture tube will generally produce a sharp crackling noise in the sound of the receiver, a faint hissing sound, noise pulses in the picture, and/or an odor of ozone. It can also cause the raster to vary in brightness. Arcing or corona is generally aggravated in high humidity areas.

In general, the exact spot of arcing or corona can be located by *close observation under subdued light*. However, if arcing or corona is not visible, it might be located by listening through a length of fibre or bakelite tubing (approximately 1" diameter, at least 18" long). Hold the tubing close to the ear with the other end directed at the suspected point of arcing or corona.

Check for arcing or corona from the front of the picture tube to the picture window, or between control escutcheon and the control shafts, by removing the chassis from the cabinet.

If the arcing or corona stops when the chassis is removed, follow the steps below.

- a. If arcing or corona is in sets with 16-inch round or 19-inch picture tubes, check to see if the picture window is grounded to chassis with a braided shield and spring. If the picture window is not grounded, see "Picture Window Grounded to Eliminate Static Charge" on page 40.

If trouble persists after re-installing chassis with grounding spring, or if trouble is in a set using 16-inch rectangular tube, proceed with steps b, c, and d below.

- b. Clean the picture tube.
- c. Clean the picture window as discussed on page 34.
- d. Check the polyethylene sheet which is mounted to the cabinet front behind the picture window. Remove the polyethylene sheet and clean it with carbon tetrachloride. If the insulating sheet is deteriorated, torn,

or has deep scratches or holes, replace it. When replacing, it is important to use short mounting staples placed as far to the top or sides of the cabinet as possible. Do not place the tacks too near the edge of the sheet.

If the place of arcing or corona cannot be located by using the above methods, disconnect the 2nd anode lead from the picture tube. To remove the 2nd anode lead in sets with 16" rectangular and 19" round tubes, it is only necessary to disconnect the 2nd anode lead plug from its socket. In sets with 16" round tubes, loosen the left side of the picture tube mounting rod, open the polyethylene ring at the top of the picture tube, and lift the 2nd anode contact spring from the metal edge of the tube.

If the corona or arcing stops when the 2nd anode lead is disconnected, the arcing or corona is around the picture tube. Proceed as follows:

- a. If trouble is with 16-inch round or 19-inch picture tubes, check the cone shaped polyethylene sheet which fits over the picture tube. Be sure that it is free of moisture. If sheet is deteriorated, torn, or has deep scratches or holes, replace it. Note that some sets do not use this polyethylene cone.
- b. Check to see that the polyethylene ring at the front of the tube and rubber collar around the neck of the tube are free from moisture, clean, and in good insulating condition.
- c. If trouble is in a 19" picture tube assembly, check the 2nd anode lead connector. Push the connector together for good contact. If the connector does not fit together tightly, tape it together. If it is too tight, trim the excess material off with a file or sharp knife.

If the arcing or corona does not stop when the 2nd anode lead has been disconnected, the trouble lies in the 2nd anode supply in the chassis. Isolate and repair as follows:

- a. Check for arcing or corona across high voltage condenser (C435). Clean surface of condenser and condenser mounting strip with carbon tetrachloride. If necessary, replace condenser.
- b. Check to see that resistor R445 is equally spaced between the sides of the socket bottom cover (corona ring). To remove the socket and components from the corona ring cover, it is only necessary to insert a screwdriver between the socket and cover and twist the screwdriver.
- c. Check for arcing or corona between terminals, leads, or windings (connections 1, 2, and 3) of the horizontal output transformer. If arcing occurs across terminals, check for protruding edges of solder or strands of wire. If arcing occurs between wire leads, separate leads. If insulation is not burned badly, the surface of wire and terminal may be cleaned with carbon tetrachloride and the part might still be usable.

REPAIRING MOUNTING LUGS ON PICTURE WINDOW

If only the mounting lug is broken on picture window 23D61-1, 23E62-1 and 23D67, a new metal lug (part

number 15A668) can be installed with a soldering iron. Instructions for installing (Form No. S340) are included with lugs.

CLEANING PICTURE WINDOW and REMOVING FINE SCRATCHES or MARS ON PLASTIC PARTS

For best results, wash the window with luke warm soapy water, rinse with clear water, and dry with a soft, lint-free cloth with as little rubbing as possible.

If necessary, use Dust-Ded (part number 98A11-2; ½ oz. bottle), or commercially available "Glim", as a plastic cleaner and dust repellent.

Caution: Do not use other cleaners or solvents. Cleaners and solvents such as kerosene, carbon tetrachloride and most of the kitchen-type cleaners may be injurious.

Most scratches on plastic parts can be removed satisfactorily. If the scratch or mar is slight, follow steps 3, 4, 5 below. If scratch is deep, follow all steps below.

1. Sand the scratch with wet #400 (wet or dry type) sandpaper. Use plenty of water. Rub with free, easy, straight strokes and finish with light featherlike strokes.
2. Clean sanded area thoroughly by swabbing with wet cotton or a very soft cotton cloth and then dry thoroughly.
3. Apply a commercial household polishing agent to

the plastic parts. Although many commercial polishing agents may be satisfactory, Parka-Polish, Simoniz Kleener, Johnson's Carnu and Wright's Silver Cream have been tried on Admiral plastic parts and found suitable. Rub in with rapid, vigorous, straight strokes. It may take several minutes of this rubbing to produce satisfactory results.

4. Remove all trace of polishing agent by swabbing with damp cotton. Inspect results carefully.
5. Dry completely, and buff entire escutcheon with clean, dry cotton.

INTERFERENCE FROM ELECTRIC RANGE SWITCHES

If the Admiral Flex-O-Heat electric range switch or other electric range switches create an electrical disturbance in the television set, connect a .25 mfd, 1000 volt DC condenser across the line input terminals to the switch. If necessary, a similar condenser should be used from each terminal to the range body or neutral.

INTERFERENCE FROM CASH REGISTERS

Television interference which is caused by operation of a cash register can be eliminated by installing an inductive-capacitive line filter (such as Tobe Filterette #1394). The line filter should be installed inside the cash register as close to the motor as possible, and should be mounted on clean surface of the metal frame. The connecting leads should be as short as possible (see instructions supplied with filter).

TROUBLE SHOOTING CHART

For additional information, see "Service Hints", "Production Changes" and page 50.

A logical trouble shooting procedure is to (1) Identify the trouble and localize it to a functional section, (2) isolate the particular circuit or stage at fault, (3) then locate the defective component(s). This procedure can best be followed by first referring to the test patterns

under "Installation and Service Adjustments", using the waveforms given on page 40, and checking voltages as indicated on the schematic.

This trouble shooting chart is arranged in sections ("PICTURE", "SOUND", etc.) for convenient reference.

DEAD SET

Symptoms	Check	Remarks
Dead set.	a. Turn off radio if set is connected in cabinet.	See "Switching in Combination Models", page 13.

PICTURE

No picture, or intermittent picture. Raster and sound OK.	a. Video section tubes (V302 to V305). b. Video IF's (V302 and V303). c. Video detector (V304). d. Open AGC circuit.	See "Video Amplifier and AGC Waveforms" on page 41.
Weak picture (insufficient contrast). Raster and sound OK.	a. Video section tubes (V301 to V307). b. Video IF alignment. c. Video IF's (V301 to V303). d. Video detector (V304). e. Video amplifier (V306). f. RF alignment. g. AGC circuit (V305).	See "Video Amplifier and AGC Waveforms" on page 41. c. Weak tube. d. Weak tube. e. Weak tube, open peaking coil L304.
"Snow" in picture background.	a. For weak signal input by comparison to set known to be good. b. Noisy tubes in RF tuner. c. 2nd anode power supply for corona discharge. d. Antenna and transmission line.	a. Beyond normal service area of a station. c. See "Arcing or Corona Discharge" on page 33. d. Be sure transmission line is not loose or mismatched.

PICTURE (Cont'd)

Symptoms	Check	Remarks
Picture jitter	a. Horizontal hold and/or lock adjustment. b. Change horizontal output (V406) if regular sections of the picture are displaced. c. For noisy tube(s) in the RF, video and sweep section of the receiver. d. Noise pick up in antenna or transmission line.	
Horizontal non-linearity.	a. Horizontal drive control setting (C424). b. Horizontal Lin. control setting (L402). c. Horizontal output (V406). d. Damper (V408).	Check "Horizontal Oscillator and Output Waveforms".
Vertical non-linearity.	a. Vertical linearity control setting (R412). b. Vertical oscillator (V401). c. Vertical output (V402).	Check "Vertical Oscillator and Output Waveforms".
Improper focus (best at extreme control position).	a. Focus coil. b. Focus control circuit. c. For circuit defect causing either excessive or low current drain from power supply.	See Run 3 in 24D1, 24E1, 24F1, 24G1 on page 38.
Improper focus (control has no effect).	a. Focus coil. b. Focus control circuit. c. Picture tube (V307). d. Audio output tubes.	If trouble is "c", picture tube (V307) may be gassy.
Engraved or bas-relief effect in picture.	a. Video amplifier (V306). b. Video detector (V304). c. Peaking coils. d. Tuning control setting or oscillator slug adjustment. e. Receiver overloading.	Output load and coupling circuit is common source of this difficulty.
Foldover of Horizontal sweep appearing as 1, 2, or 3 white vertical bars in center of picture.	a. See "Horizontal Drive Adjustment" on page 7.	
Smeared effect in picture (poor low frequency video response).	a. Video detector (V304). b. Video amplifier (V306). c. Video IF stages.	Trouble might be at transmitter; check more than one station. c. Alignment.
Poor picture detail (poor definition).	a. Tuning adjustment. b. Alignment, RF and IF. c. Video detector circuit (V304). d. Video amplifier circuit (306).	d. Check peaking coils. (May have shorted turns).
Vertical bars on right side of picture.	a. Horizontal oscillator tube (V405).	
Sound bars in picture.	a. Tuning adjustment. b. Microphonic tubes in tuner. c. HF oscillator alignment, page 17. d. Alignment of 21.25 MC traps.	If on one channel, see "Individual Channel Slug Adjustment Using Television Signal" on page 5.
Herringbone pattern super-imposed on picture.	a. FM interference. b. Oscillation in the Sound IF system.	a. Can best be cured at source. Traps may also be used at the receiver. See page 5. b. Re-route transmission line from antenna terminals to tuner.
Continual "wobble" or ripple in picture.		See "Copper Band (Painted Black) Added to Power Transformer To Eliminate Picture Ripple" on page 39.
Adjacent channel interference.	Complete sound and video alignment.	See discussion on adjacent channel traps L309 and L310 on page 39.
Brightness control will not completely cut-off pict. tube beam current.		See Run 4 in 24D1, 24E1, 24F1, 24G1 and Run 2 in 24H1 on page 38.
Top of picture (approx. 2 inches) jitters.	a. Lead dress on Hor. hold control R432. b. Leaky condenser C417. c. Vertical deflection yoke.	a. Dress white lead from Hor. Hold control away from vertical output transformer T402.
Horiz. linearity changes greatly with setting of Horizontal Hold control.		See "Horizontal Oscillator Cathode Resistor R430 Changed" on page 40.

SOUND

Symptoms	Check	Remarks
*Weak, noisy, intermittent sound, or no sound. Picture OK.	a. Sound IF stages (V201 and V202). b. Ratio detector circuit (V203). c. Audio amplifier circuit (V204). d. Audio output circuit (V205). e. Speaker.	Alignment; defective tube or other circuit component.
Audio Buzz.	a. Ratio detector tube (V203). b. Be sure that "foil end" of condenser C211 is connected to volume control.	

SOUND AND PICTURE

*No sound or picture; or intermittent sound or picture. Raster OK.	a. RF tuner circuit (V101, V102). b. IF stage (V301). c. Low voltage power supply. d. Video amplifier circuit (V306).	a. Poor contact in turret assembly. d. Failure of the video amp. (6AC7) will cause the RF amp. and 1st and 2nd video IF amplifiers to cut-off.
Picture and sound do not "tune-in" together.	a. Video IF and Trap alignment. b. Weak signal strength.	Check antenna.

SYNC

No horizontal or vertical sync. Picture signal OK.	a. Tubes V401 and V403. b. Sync separator (V403). c. Sync inverter (V401B).	Check waveforms at TP5, TP6, TP7, TP8, TP9.
No horizontal sync. Vertical sync. OK.	a. Tubes V404 and V405. b. Horizontal sync discriminator circuit (V404). c. Tolerance of R424, R425, and R426. d. Leaky condensers C412, C413, C414, and C417.	Check waveforms at TP10, TP11.
No vertical sync. Horizontal sync. OK.	a. Tube V401. b. Integrator network. c. Value of R404. d. Condenser C404.	b. Defective component.
Picture "locks in" only at center of Hor. Hold control. Falls out on both sides.	a. Hor. Sync disc. tube (V404). b. Hor. Sync disc. circuit.	b. Check tolerance of condensers and resistors. R426 is common cause.

RASTER

No raster. Sound OK.	a. Fuse M401. b. Ion trap reversed or needs adjustment. c. Tubes V405, V406, V407, V408, and V307. d. Horizontal Oscillator circuit (V405). e. If Horizontal Oscillator circuit is OK, check horizontal output transformer (T404). f. Focus coil circuit (open).	2nd anode voltage (approx. 13. KV) is obtained by auto-transformer action in the primary circuit of T404. If the horizontal oscillator (V405) or horizontal output (V406) circuits fail, no voltage will be developed in T404 (to be rectified by the 1B3GT tube), resulting in loss of 2nd anode voltage. Check "Horizontal Oscillator and Output Waveforms".
Intermittent raster. Sound OK.	a. Tubes V307, V405, V406, V407, and V408. b. 2nd Anode power supply (V407, V408). c. Horizontal oscillator (V405). d. Horizontal output (V406). e. Damper (V408). f. Focus coil circuit (intermittent open). g. Picture tube (V307) circuit.	Check for arc-over or corona discharge in the second anode power supply. See "Arcing or Corona Discharge" on page 33. Check "Horizontal Oscillator and Output Waveforms".
Insufficient raster brilliance.	a. Ion trap adjustment. b. Picture tube (V307). c. High voltage power supply (V501). d. Low AC line voltage. e. Setting of Horizontal Drive (C424). f. Low 2nd anode voltage.	b. Check by substitution. c. Weak tube, open filter condenser.
Rounded corners on raster. Brilliance OK.	a. Ion trap adjustment for maximum brightness. b. Adjust picture positioning lever or focus coil.	See "Picture Centering" on page 6.

* If on one channel only, individual channel oscillator slug may be misaligned. See page 5.

RASTER (Cont'd)

Symptoms	Check	Remarks
Foldover of Horizontal sweep appearing as 1, 2, or 3 white vertical bars in center of picture.		See "Horizontal Drive Adjustment" on page 7.
Raster too small (insufficient height and width).	a. Height and width adjustments (R409 and T405). b. Tubes V307 and V501. c. High voltage power supply (V501). d. AC line voltage (low).	b. Gas content will decrease the deflection sensitivity of the picture tube (improper focus will also result).
Bunching of several trace lines appearing as a white band across raster.	a. Vertical output tube (V402).	
Vertical lines or "wrinkles" on left side of raster. Two complete "wavy" images might appear on screen.	a. Spurious oscillations in horizontal output (V406). b. Deflection yoke.	See "Run 4 in 24H1" and "Run 5 in 24D1, 24E1, 24F1, 24G1" on page 38.
Light and dark vertical bars. Bad horizontal linearity. Foldover on left side of picture.	a. Damper tube (V408).	
Two heavy black horizontal bars covering picture tube screen.	a. Power supplies for open filter. b. Short in B+ circuit. c. 120 cycle pick up in grid or cathode circuit of picture tube.	a. Open or leaky filter capacitor. b. Shorted capacitor.
No raster, fuse M401 blows when set seems to be operating OK.	a. Damper tube V408.	
Raster "blooms" (gets larger) as "picture" control is advanced.	a. 2nd anode filter resistor R445. b. Horizontal output tube V406.	
Tilted raster.	a. Position adjustment of deflection yoke.	
Raster not centered.	Adjust picture positioning lever or focus coil.	See "Picture Centering" on page 6.
Excessive raster size (too large a picture for the picture tube mask).	a. Height and width adjustments (R409 and T405). b. Second anode power supply. c. Horizontal drive control (C424) setting. See "Installation and Service Adjustments." d. Horizontal output transformer (T404).	Low second anode potential increases the deflection sensitivity of the picture tube. Check 1B3/8016 tube by substitution. d. Shorted turn in primary.
Trapezoidal or "keystoned" raster.	a. Deflection yoke.	a. Shorted coil turns.
Insufficient raster width.	a. Width adjustment (T405). b. Horizontal oscillator (V405). c. Horizontal output (V406). d. Horizontal output transformer (T404). e. Horizontal drive adjustment (C424).	
Insufficient raster height.	a. Height and Linearity adjustment. b. Vertical oscillator (V401). c. Vertical output (V402).	a. Keep vertical linearity consistent with setting of height control. b. Defective component. c. Defective T402 or T403.
Bright horizontal line. No vertical deflection, no raster.	a. Vertical oscillator (V401). b. Vertical output (V402). c. Deflection yoke (T403).	Check "Vertical Oscillator and Output Waveforms".
Bright vertical line. No horizontal deflection, no raster.	a. Open deflection yoke (T404).	

PRODUCTION CHANGES

At the start of production, chassis were not stamped with a run number.

Production changes are coded RUN 1, RUN 2, etc., as given in the headings below. Run number stamped on chassis indicates that this chassis has the change(s) incorporated which are explained under that particular run number heading below, as well as all changes (lower run numbers) made prior to that time.

Note that numerical symbols ①, ②, ③, etc., on the schematic indicate run numbers (production changes) for chassis with round picture tubes.

Numerical symbols 1, 2, 3, etc., indicate run numbers (production changes) for chassis with rectangular picture tubes.

RUN 1 in 24D1, 24E1, 24F1, 24G1

Voltage rating of C214 increased. Condenser C214 was changed from .0022 mfd, 600 volts to a .0022 mfd, 1000 volts (part number 64A2-11) to prevent breakdown.

RUN 1 in 24H1 and

RUN 2 in 24D1, 24E1, 24F1, 24G1

Alignment point "S" changed. Test jack connector for injection of the 4.5 MC signal as explained in step 10 in the "IF Amplifier and Trap Alignment" was changed from junction of L302 and L303, to plate (pin 7) of the video detector V304. This resulted in a more definite dip at 4.5 MC when aligning the 4.5 MC trap (L303 and C307).

RUN 2 in 24H1

R322 decreased in value to increase brightness control range. Picture tube brightness range was increased by changing resistor R322 from 100,000 ohms, 1/2 watt to 33,000 ohms, 1/2 watt (part number 60B8-333). With this change, the Brightness control will completely cut off the picture tube beam current when the Picture control is advanced all the way.

RUN 3 in 24D1, 24E1, 24F1, 24G1

Current limiting resistor (R328) deleted to improve focus. Due to variations in tube characteristics of short-neck picture tubes, it was necessary to add R328 (22,000 ohms, 2 watt) to some receivers produced before RUN 3. Other receivers did not have this resistor. In a few sets, a compromise resistor of 15,000 ohms was used.

If difficulty in focus is encountered in any chassis (either earlier or later than Run 3), determine if resistor R328 is necessary by checking as follows:

- Picture will focus only with focus control all the way to the right (clockwise). Add R328 (22,000 ohms, 5 watt, part number 60B20-223).
- Picture will focus with focus control all the way to the left (counterclockwise). Remove R328.

If adding or removing R328 does not help, try changing the 6V6GT audio output tube (V205).

RUN 3 in 24H1

Interlock bracket changed. The 2nd anode housing was changed so that the line cord will pull away from the plug interlock and break the primary circuit of the

power transformer when the 2nd anode housing cover is opened, thus preventing possibility of shock.

RUN 4 in 24D1, 24E1, 24F1, 24G1

Audio amplifier circuit changed. The 6SQ7 audio amplifier previously used (as shown under "Audio Amplifier Circuit in Early Sets" at right of schematic) in the 24D1, 24E1, 24F1, 24G1 chassis was deleted and replaced by a 6AU6 tube and circuit as shown on schematic.

R322 decreased in value to increase brightness control range. Picture tube brightness range was increased by changing resistor R322 from 100,000 ohms, 1/2 watt to 33,000 ohms, 1/2 watt (part number 60B8-333). With this change, the Brightness control can be made to completely cut off the picture tube beam current when the Picture control is advanced all the way.

RUN 4 in 24H1 and

RUN 5 in 24D1, 24E1, 24F1, 24G1

Resistor R448 added to 6CD6 screen grid to reduce parasitics. A 100 ohm, 1/2 watt resistor R448 (part number 60B8-101) was added to the 6CD6 screen grid as shown in schematic to reduce parasitic oscillations in this circuit. These oscillations will generally cause a double image with a "wavy" effect.

Do not confuse this condition with the "continual ripple" explained under "Copper Band Added To Power Transformer To Eliminate Picture Ripple" on page 40.

RUN 5 in 24H1

R503 added to prevent static charge on chassis. A 270,000 ohm, 1/2 watt resistor R503 (part number 60B8-274) was added from one side of the 117 volt AC line to ground to provide a DC return for any static charge that might build up on the chassis.

RUN 6 in 24D1, 24E1, 24F1, 24G1

Interlock bracket changed. The 2nd anode housing was changed so that the line cord will pull away from the plug interlock and break the primary circuit of the power transformer when the 2nd anode housing cover is opened thus preventing possibility of shock.

RUN 7 in 24D1, 24E1

Picture tube and focus coil mounting bracket changed to improve picture centering. The picture tube and focus coil mounting brackets (top and bottom)

were changed to improve picture centering. Early mounting brackets had a tendency to tilt backward slightly, making it difficult to bring the raster down enough to fill the picture window. See parts list for early and late top and bottom picture tube and focus coil mounting brackets.

RUN 7 in 24F1, 24G1

High voltage compartment changed. The high voltage compartment was changed so that the cover could be removed easily without removing the chassis. This change was only necessary on these chassis due to their mounting arrangement in the cabinet.

RUN 8 in 24E1, 24G1

Jumper wire added to socket M504 to accommodate 5D2 radio. A jumper wire was added between pins "M" and "N" of socket M504 to supply plate voltage to the extra lead on the 5D2 radio. The 5B2 radio connecting cable has 8 leads, and the 5D2 radio has 9.

RUN 8 in 24D1, 24F1

R503 added to prevent static charge on chassis. A 270,000 ohm, $\frac{1}{2}$ watt resistor R503 (part number 60B8-274) was added from one side of the 117 volt AC line to ground to provide a DC return for any static charge that might build up on the chassis.

RUN 9 in 24E1, 24G1

R503 added to prevent static charge on chassis. A 270,000 ohm, $\frac{1}{2}$ watt resistor R503 (part number 60B8-274) was added from one side of the 117 volt AC line to ground to provide a DC return for any static charge that might build up on the chassis.

R504 added to limit jewel light current. A 3.3 ohm, $\frac{1}{2}$ watt resistor (part number 60B28-10) was added in series with jewel light M508 to limit current.

RUN 9 in 24F1

and

RUN 10 in 24G1

Picture tube and focus coil mounting bracket changed to improve picture centering. The picture tube and focus coil mounting brackets (top and bottom) were changed to improve picture centering. Early mounting brackets have a tendency to tilt backward slightly, making it difficult to bring the raster down enough to fill the picture window. See parts list for early and late top and bottom picture tube and focus coil mounting brackets.

RUN 6 in 24H1

RUN 9 in 24D1

RUN 10 in 24E1, 24F1

RUN 11 in 24G1

Traps added to eliminate possibility of adjacent channel interference. Two adjacent channel traps L309 (27.25 MC) and L310 (19.75 MC) were added between the output of the TV tuner and the input of the 1st Video IF amplifier V301 (6AU6). This was done to eliminate the possibility of interference from the video carrier of the adjacent channel above and the sound carrier of the adjacent channel below.

This interference might be evident if two stations are operating on adjacent channels in the same locality, especially when the wanted station is weaker than the interfering station.

Adjacent channel interference may take either of these two forms:

Adjacent Channel Video Interference. The picture has an interference pattern produced by the video carrier of the adjacent **higher** channel. Sometimes the interference will appear as a superimposed picture (stationary or moving slowly); at other times it may appear as a number of diagonal lines or as a vertical moving bar.

Adjacent Channel Sound Interference. The picture has a herringbone interference pattern produced by the sound carrier of the adjacent **lower** channel. Close examination will often reveal that the fine lines of the herringbone pattern vary in accordance with the speech or music on the adjacent lower channel. This can be checked by quickly turning the channel selector to this station.

Since these types of interference effects can also be produced by other sources of interference, and also by misalignment of the video IF's and traps, trouble from these sources should be checked before deciding traps are required.

The 19.75 MC trap will remove adjacent channel video interference, and the 27.25 MC trap will remove adjacent channel sound interference.

A complete Adjacent Channel Trap Assembly (includes L309, L310, C313, C314 and mounting bracket) is supplied under part number A3320.

To install the adjacent channel trap assembly, proceed as follows:

Fit the legs of the bracket over condenser C426 so that the left mounting foot lines up with the unused hole in the chassis (to the left of C426). See illustration. Secure the left mounting foot to the chassis with a #8- $\frac{1}{4}$ " self tapping screw. Spot solder the other mounting foot to the chassis to save drilling a new hole.

Unsolder L301 from the TV tuner output and solder it to the empty lug on the assembly. It may be necessary to extend the lead on L301 with a small piece of wire. Connect the base lead from the other lug to the tuner output lug.

To align the traps, follow the alignment instructions

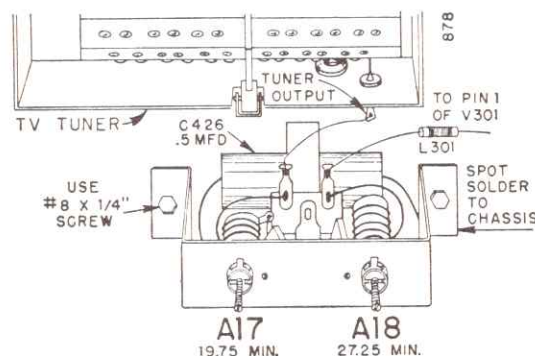


Figure 28. Bottom of Chassis, Showing Adjacent Channel Traps.

given in steps 2 and 3 on page 14 and make the "Video IF Alignment Check" on page 15.

The traps will cause the 25.75 MC marker to move slightly. This will not make any noticeable difference in the picture, but slight adjustment (not more than one turn in either direction) of slug A7 (25.3 MC coil) will bring it to its proper location. See figure 22.

COPPER BAND (PAINTED BLACK) ADDED TO POWER TRANSFORMER TO ELIMINATE PICTURE RIPPLE

To reduce 60 cycle pickup, which produced a continual very slowly moving "wobble" or ripple in the picture, a 2-inch copper band (painted black) was added to each side of the power transformer T501. This condition is only possible in areas where the power source for the station is different than for the receiver. If this difficulty is encountered, try a similar shield on these early transformers, or if necessary, replace with new transformer. All service replacement transformers will have the 2-inch copper band on each side.

Note that the power transformer is mounted on top of the chassis in early production sets, and is mounted underneath on later production sets.

PICTURE WINDOW GROUNDED TO ELIMINATE STATIC CHARGE

A ground wire and spring clip are used in all but early production sets, with round picture tubes, to eliminate any static charge that might be present on the picture window, cabinet, or control escutcheon, which might also result in corona effects. (For additional discussion on corona effects, see page 33.)

These early picture windows (part number 23D61 for 16-inch sets and part number 23E62 for 19-inch sets) can be grounded by connecting ordinary braided shield from the mounting screw on the lower right hand corner of the picture window to chassis.

HORIZONTAL OSCILLATOR CATHODE RESISTOR R430 CHANGED

Resistor R430, which is used for feedback from one section of the horizontal oscillator to the other, was changed in some sets from 1500 ohms to 1600 ohms. It is preferable to have a resistance of 1600 ohms in this circuit, however, in most chassis a resistance of near 1600

ohms was obtained by using 1500 ohm resistors with a positive tolerance. If this resistance is lower than specified, the horizontal linearity will change to a large degree with different Horizontal Hold settings.

ARCING FROM 6S4 TUBE SOCKET TO CHASSIS

In early sets, arcing might occur between pin 9 of the 6S4 vertical output tube socket and ground. This will cause damage to the socket and to the 2,200 ohm, 2 watt dropping resistor R417. If this happens, replace the socket with later production socket, part number 87A25-3. Also replace resistor R417, part number 60B14-222, even though it might check OK with an ohmmeter.

SHIELD ADDED BETWEEN VERTICAL OSCILLATOR TUBE (V402) AND AUDIO OUTPUT TUBE (V205)

A shield was added between the vertical oscillator tube and audio output tube to prevent possibility of 60-cycle (vertical repetition rate) pick-up in the audio amplifier and audio output section. This shield (part number 15B625) is in all 24H1 chassis, and holes are available on early 24D1, 24E1, 24F1, 24G1 chassis. Use two #8-32 self-tapping screws for mounting the shield.

CHASSIS MOUNTING BOLT SHORT CIRCUITING WIDTH CONTROL T405 in 24D1, 24F1 CHASSIS

In early production "television only" models, the chassis is mounted on a mounting board with 1 1/4" mounting bolts. The mounting bolt near the "Horiz. Width" control might short circuit the width control, resulting in insufficient width, horizontal non-linearity, and loss of picture brightness, or no raster at all.

To correct, pull the mounting board four or five inches out of the cabinet to remove the mounting bolt, then place four or five washers under the bolt head. Late production sets use a shorter bolt.

When installing chassis, do not use a sharp pointed tool for locating this mounting hole, as the width control winding might be damaged.

MOUNTING OF C435 CHANGED

In early sets, the 2nd anode filter condenser C435 (500 mmfd, 20,000 volts, ceramic) used a tapped screw hole mounting at one end and a threaded stud on the other end. In later sets, C435 uses threaded studs on both ends of the condenser.

WAVEFORM ANALYSIS

SERVICING BY WAVEFORM ANALYSIS

After a circuit defect has been localized to the video or sweep sections of a television receiver (see troubleshooting chart), localization to a single stage can be accomplished by use of the waveforms shown. Voltage or resistance measurements can then be used to locate the defective part in a conventional manner.

Two separate waveforms are shown for TP1, TP2, TP5, TP6, TP7, TP8 and TP9. Two different oscilloscope sweep frequencies are used in order to show up the

vertical and horizontal pulses at each test point (both cannot be locked in at the same sweep frequency due to the great difference in, and non-integral relationship of, the vertical and horizontal pulse frequencies). The oscilloscope sweep is adjusted for one half of the frequency of the vertical frequency (60 cycles) or the horizontal frequency (15.75 KC) in order that two pulses will appear on the screen.

The peak-to-peak (PP) voltages indicated for the various waveforms can be used to determine the voltage

gain per stage. For example: the peak-to-peak voltage reading at TP1 (input to video amplifier) is 1.5 volts. The peak-to-peak voltage reading at TP2 (output of video amplifier) is 45 volts. A voltage gain of 30 can be determined by dividing the output voltage by the input voltage.

If a peak-to-peak meter is not available for these measurements, the oscilloscope can be calibrated with a known voltage and used as a reference for comparison. If the known voltage is a sine wave, multiply the RMS value by 2.83 to find the peak value obtained on scope.

Turn Picture control fully to the right. Varying this control will produce corresponding variations in peak-to-peak voltages in TP1, TP2, TP3 and TP5 through TP10.

A change in waveform may be noticed at the first two test points when the receiver is switched to a different television station. This is true since some variations in the transmitted waveform are tolerated at the television

transmitter. All waveforms and peak-to-peak voltage readings are subject to modification due to the response of the oscilloscope used for test. Due to parts and manufacturing tolerances, variations in peak-to-peak voltages between television receivers are a normal condition. Hence, when using waveforms and peak-to-peak voltage readings for quick trouble shooting, these variations should be kept in mind to avoid erroneous conclusions.

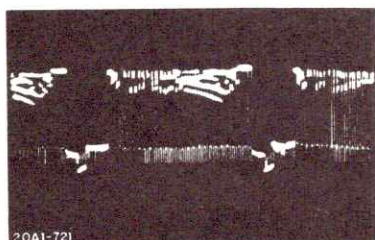
WARNING

Waveform analysis of high voltage sections of the receiver is not recommended, extreme care should be taken to avoid contact with these circuits. Care should be exercised when taking measurements on the horizontal output stage. No connections should be made to the plate cap of the V406 (6CD6G) or to any connections on the rectifier tube (1B3GT/8016) as the high voltages at these points are dangerous.

CONTROL SETTINGS AND CONNECTIONS

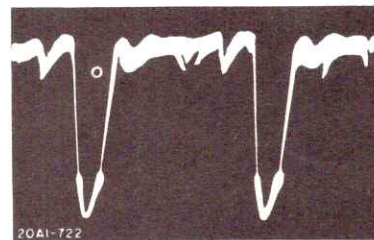
- Picture control set fully to the right.
- Antenna connected for TP1, TP2, TP3, and TP5 thru TP10.
- On some test points it may be necessary to connect an isolating resistor (approx. 100,000 ohms) in series with probe lead of scope.

VIDEO AMPLIFIER and AGC WAVEFORMS

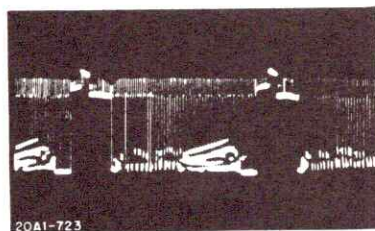


1.5 Volts PP Vertical Pulse

***TP1**
Grid of Video Amplifier
Pin 4 of V306 (6AC7)

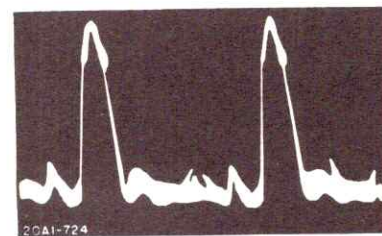


1.5 Volts PP Horizontal Pulse

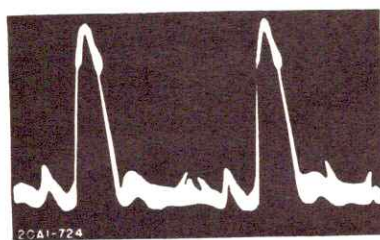


45 Volts PP Vertical Pulse

***TP2**
Output of Video Amplifier
Junction of L304 and L305

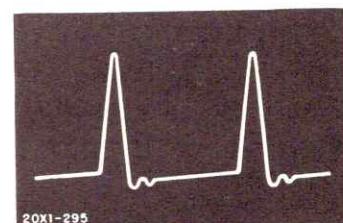


45 Volts PP Horizontal Pulse



45 Volts PP Horizontal Pulse

***TP3**
Grid of AGC
Pin 1 of V305 (6AU6)

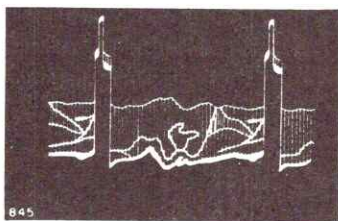


350 Volts PP Horizontal Pulse

TP4
Plate of AGC
Pin 5 of V305 (6AU6)

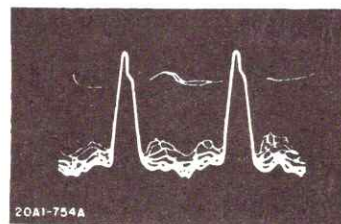
* Waveforms obtained only with transmitted picture signal input.

SYNC CIRCUIT WAVEFORMS

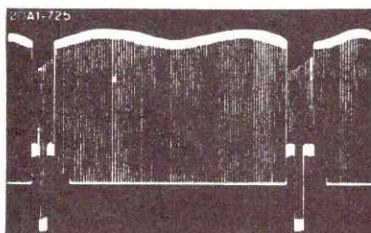


45 Volts PP Vertical Pulse

***TP5**
Grid of Sync Separator
Pin 2 of V403 (12AU7)

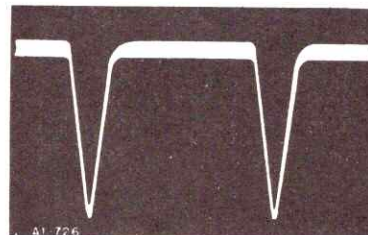


45 Volts PP Horizontal Pulse

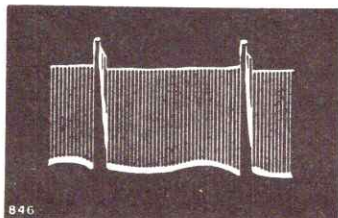


45 Volts PP Vertical Pulse

***TP6**
Plate of Sync Separator
Pin 1 of V403 (12AU7)

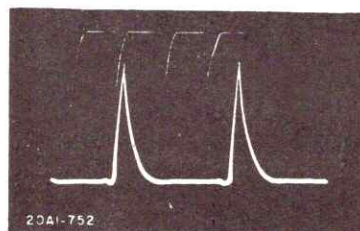


30 Volts PP Horizontal Pulse

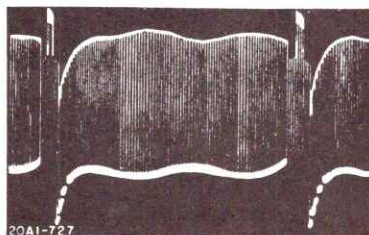


Vertical Pulse
115 Volts PP (TP7)
65 Volts PP (TP8)

***TP7**
Plate of Clipper
Pin 6 of V403 (12AU7)
and
***TP8**
Grid of Sync Inverter
Pin 4 of V401B (6SN7GT)

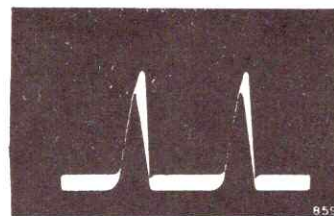


Horizontal Pulse
115 Volts PP (TP7)
65 Volts PP (TP8)

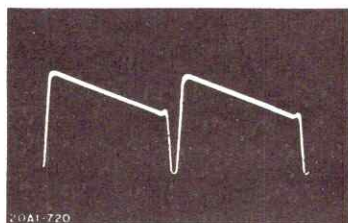


15 Volts PP Vertical Pulse

***TP9**
Cathode of Sync Inverter
Pin 6 of V401B (6SN7GT)
Waveform on plate (pin 5)
is identical, but reversed
180 degrees.

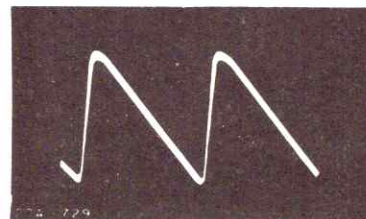


15 Volts PP Horizontal Pulse



10 Volts PP

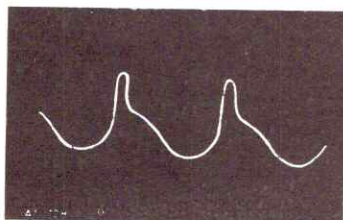
***TP10**
Cathode of Hor. Sync. Disc.
Pin 1 of V404 (6AL5)



12 Volts PP

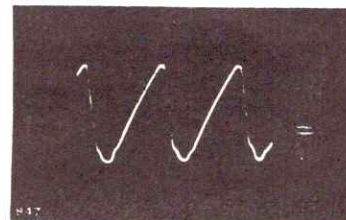
TP11
Plate of Hor. Sync. Disc.
Pins 5 and 7 of V404 (6AL5)

HORIZONTAL OSCILLATOR and OUTPUT WAVEFORMS

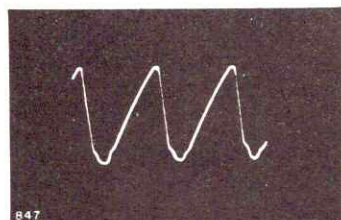


50 Volts PP
TP12
Plate of Hor. Osc.
Pin 2 of V405
(6SN7GT)

100 Volts PP
TP13
Plate of Hor. Osc.
Pin 5 of V405
(6SN7GT)

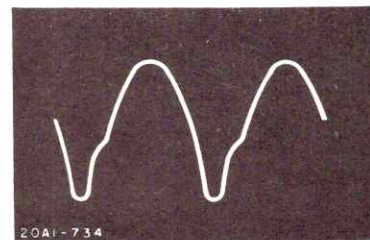


* Waveforms obtained only with transmitted picture signal input.

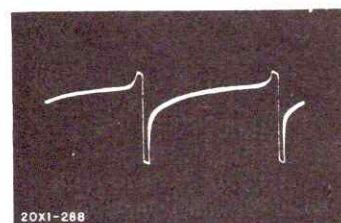


85 Volts PP
TP14
 Grid of Hor. Output
 Pin 5 of V406
 (6CD6G)

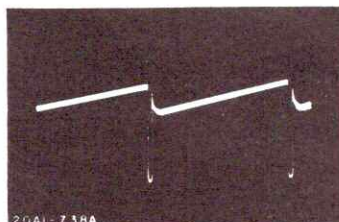
25 Volts PP
TP15
 Cathode of Damper
 Pin 3 of V408
 (6W4GT)



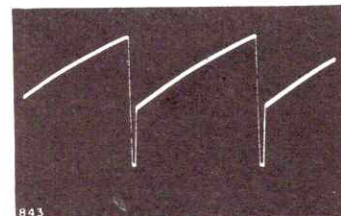
VERTICAL OSCILLATOR and OUTPUT WAVEFORMS



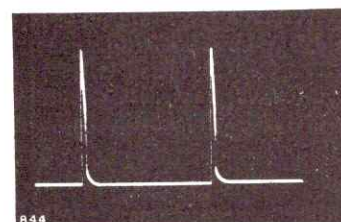
75 Volts PP
TP16
 Grid of Vertical Osc.
 Pins 1 of V401A (6SN7GT)



75 Volts PP
TP17
 Plate of Vertical Osc.
 Pin 2 of V401A (6SN7GT)



60 Volts PP
TP18
 Grid of Vertical Output
 Pin 6 of V402 (6S4)



900 Volts PP
TP19
 Plate of Vertical Output
 Pin 9 of V402 (6S4)

115 Volts PP
TP20
 Vertical Output
 Centertap of T402

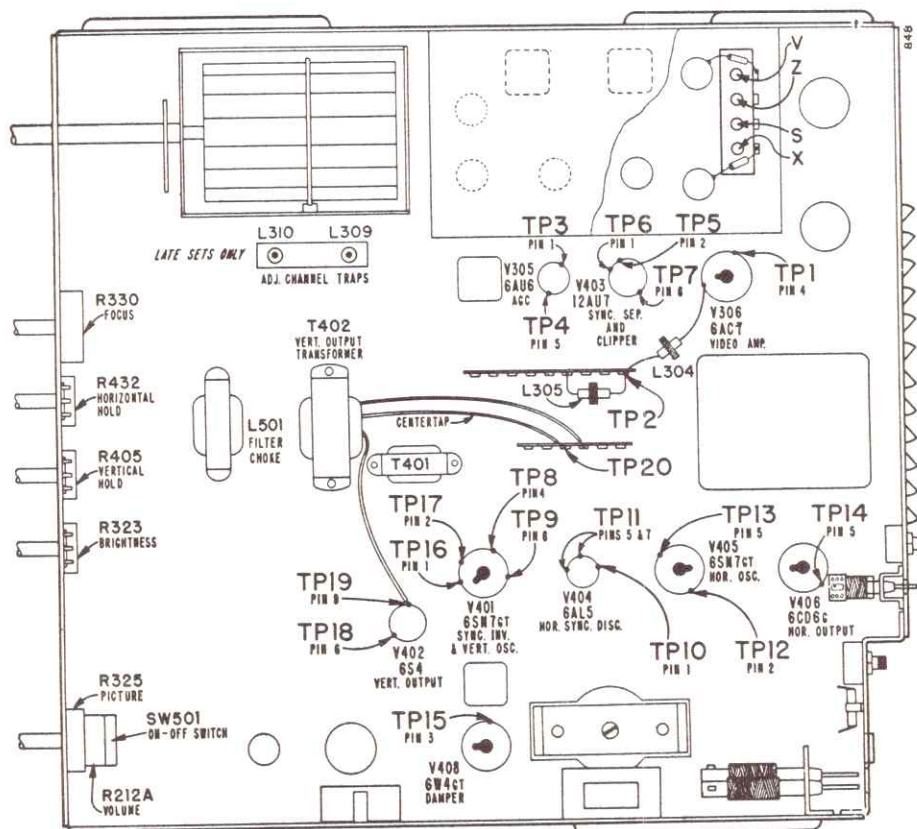
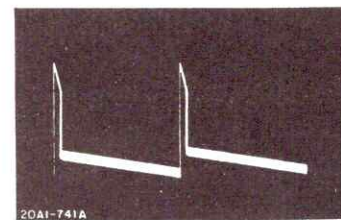


Figure 29. Bottom View of Chassis Showing TP Locations.

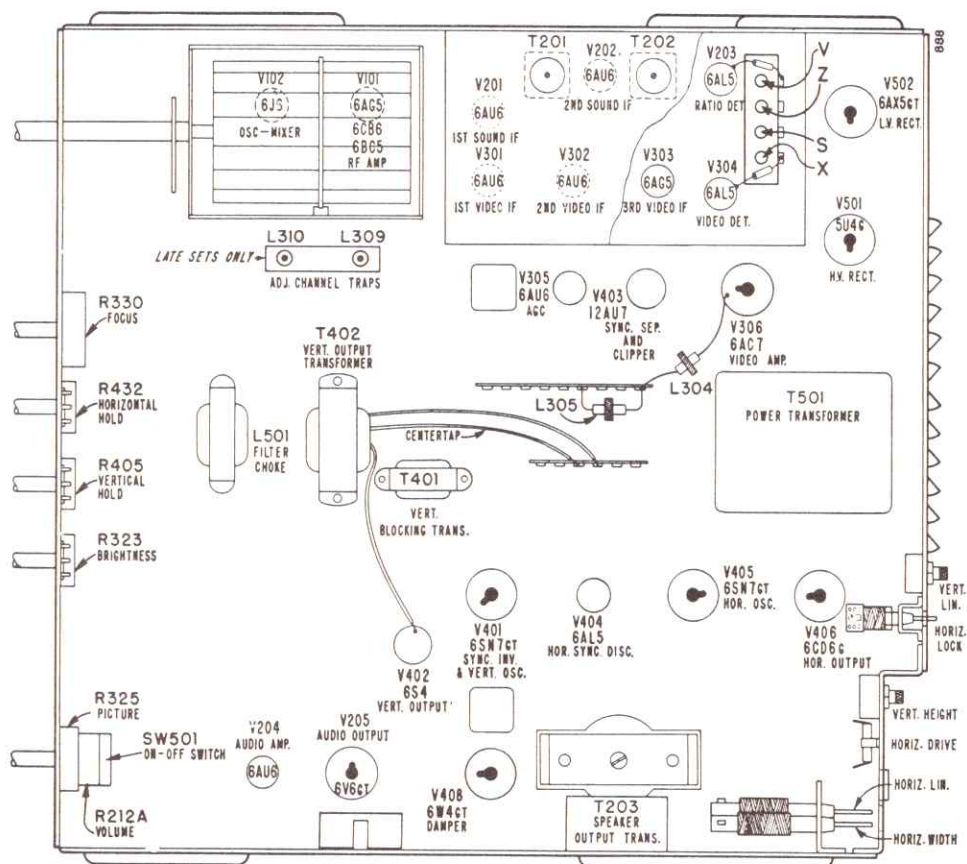


Figure 30. Bottom View of TV Chassis Showing Tube Locations.

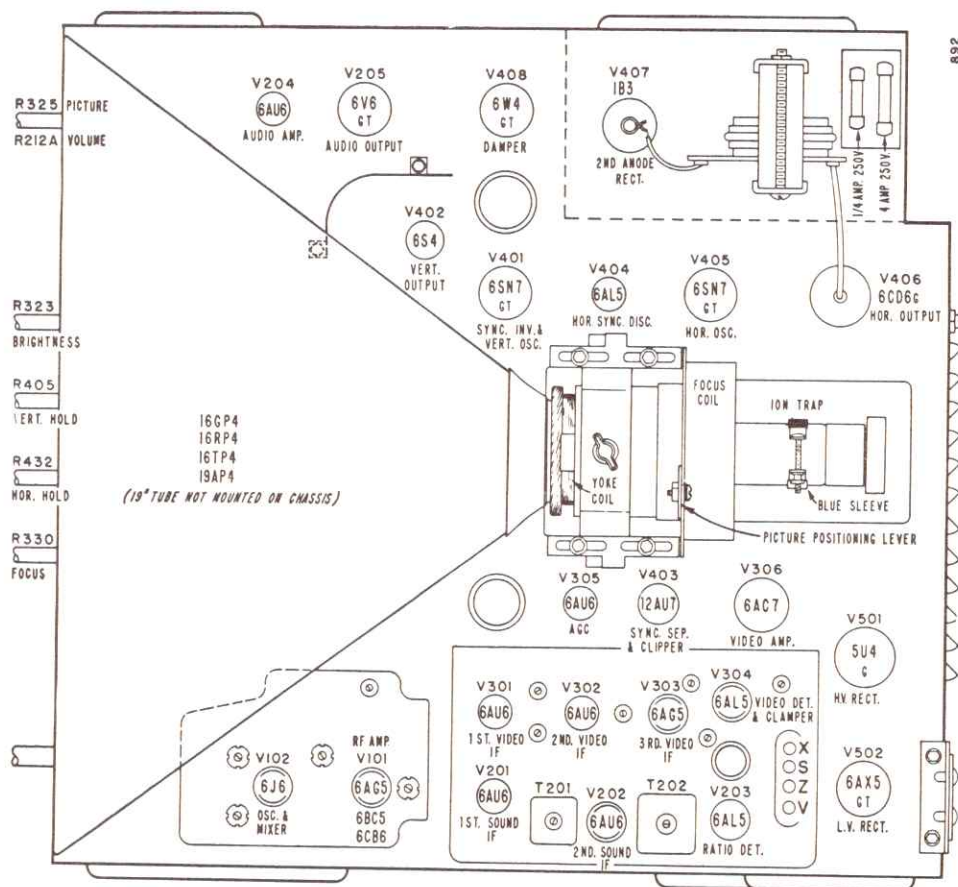


Figure 31. Top View of TV Chassis Showing Tube Locations.

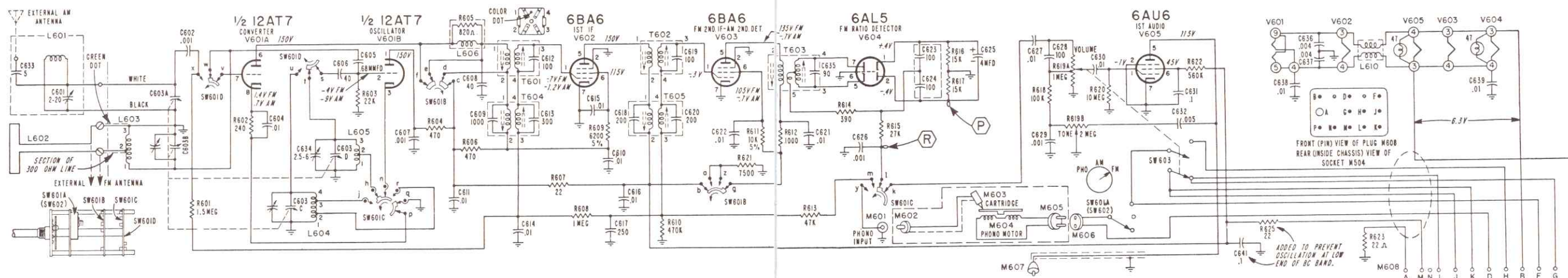


Figure 33. Schematic for 5B2 radio. The 5D2 radio circuit (used in late sets) is shown on the reverse side.

Note: Resistance value of volume control R619A should be 2 megohms instead of 1 megohm as shown in the above schematic.

5B2, 5D2 RADIO (AM-FM)

5B2 and 5D2 differences discussed in "Radio Chassis Notes" on page 3.

SWITCHING IN COMBINATION MODELS

If the television and radio are turned on at the same time, neither unit will operate. For details, see "Switching In Combination Models" on page 13.

SERVICING RADIO SEPARATELY

See discussion near schematic on preceding page.

R640 and C653 ADDED TO 5B2 RADIO TO PREVENT OSCILLATION

In the 5B2 radio chassis, R640 (22 ohms, $\frac{1}{2}$ watt, part 60B8-220) was added in series with the B+ lead going to pin "M" on plug M608. C653 (.1 mfd, 400 volts, part 64B1-20) was connected between R640 and the B+ lead to chassis ground. This change was made to prevent oscillation on the low end of the AM band.

SENSITIVITY IMPROVED IN 5D2 RADIO

To improve the sensitivity of the 5D2 radio, the 1st IF transformers in the AM and FM stages were changed.

The 1st AM-IF transformer (T604) used in early sets, part 72B97 has been replaced with part 72B97-1.

The 1st FM-IF transformer (T601) used in early sets, part 72B98 has been replaced with part 72B98-1.

To accommodate this change of the IF transformers, C608 condenser has been changed from 40 mmfd (part 65B1-65) to 30 mmfd (part 65B1-69); R602 has been changed from 240 ohms 5%, $\frac{1}{2}$ watt (part 60B7-241) to 1,500 ohms, $\frac{1}{2}$ watt (part 60B8-152).

Important: All changes mentioned above must be made when replacing early IF transformers with late IF transformers.

REMOVING RECORD CHANGER

Remove by merely lifting it off its float springs.

REMOVING RADIO CHASSIS FOR SERVICING

The complete Radio-Phono unit does not need to be removed unless the Tilt-Out, or Slide-Out mechanisms need repair. The Tilt-Out mechanism is released by springing each of the four tilt-out hinge arms away from

the unit's sides. The Slide-Out mechanism is removed in a conventional manner.

The radio tubes can be serviced from the top of the chassis by merely lifting the record changer up from the front. Be sure that the two shipping screws, one on each side of the changer pan, have been removed at time of installation. These screws should be retained in case of future moving or shipping.

To remove the radio chassis for complete alignment or for servicing the underside of the chassis, proceed as follows:

- Remove the radio mounting screws at the sides and at the seams on the underside of the housing. Pull the radio chassis down and forward until you can reach in and unplug the phono connector plugs.
- Remove the tuning knobs; remove the radio escutcheon and the front housing by removing the five screws at the bottom of the housing.
- Position the dial drum as shown in Figure 34. Unhook spring at "A", and while keeping tension on the dial cord, hook it to tab "B".
- Remove the six hex-head screws "C" which hold chassis cover and dial scale to chassis.
- After removing the pilot light brackets and hex nut "D" and "E", the chassis front can be pulled away from the chassis. All trimmers and parts are now accessible.

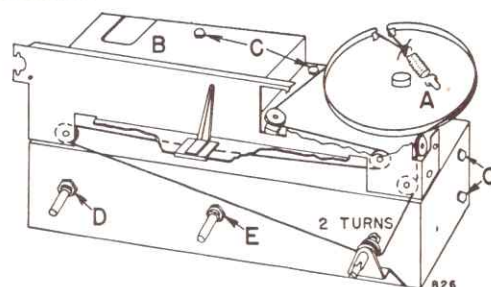


Figure 34. Radio Chassis With Front Housing Removed.

AM-FM RADIO ALIGNMENT

FM ALIGNMENT EQUIPMENT

FM circuits should be aligned only with an AM signal generator and a vacuum tube voltmeter. Any standard vacuum tube voltmeter with a DC scale of not over 5 volts is suitable. A 3-volt zero center scale is desirable. A signal generator with a fundamental frequency range up to 110 MC is desirable. It is possible however, to align the receiver with a signal generator going up to 20 or 30 megacycles, by using the harmonics of these lower frequencies. To do this merely set the signal generator dial as indicated in the next paragraph and align exactly as explained

in the alignment instructions.

Where alignment chart specifies 109 MC, 106 MC, 92 MC or 87 MC, set generator to the highest available frequency shown in the column under that frequency:

109. MC	106. MC	92. MC	87. MC
54.50MC	53. MC	46. MC	43.5 MC
36.33MC	35.33MC	30.66MC	29. MC
27.55MC	26.5 MC	23. MC	21.75MC
21.80MC	21.2 MC	18.4 MC	17.4 MC
18.17MC	17.66MC	15.33MC	14.5 MC

IMPORTANT PRELIMINARY ALIGNMENT STEPS

Under normal operating conditions or use, misalignment of RF or IF circuits with age will be slight. Lack of sensitivity and poor tone quality may be due to causes other than alignment. Do not attempt to realign the receiver until all other possible causes have first been thoroughly investigated.

In FM alignment, it is essential that every step be followed. Especially important is picking the center of the IF curve (step 4 in the FM-IF alignment instructions). During this portion of the alignment it is necessary to tune the signal generator very carefully; it may necessitate having to estimate the dial readings to a tenth of a division.

When completely aligning the FM circuit, it is essential to follow the sequence of steps in the chart. If only a portion of the FM circuit is being aligned, be sure to follow all the remaining steps. AM and FM alignment may be made independently

of each other.

For alignment of IF slug adjustments, it will be necessary to disassemble the radio chassis from the escutcheon and housing and also remove the chassis cover and dial scale assembly. See figure 34. NOTE: AM and FM oscillator and antenna trimmers are accessible from top of chassis; disassembly of chassis cover and dial scale will generally not be required.

Disconnect FM antenna from twin lead cable. Stretch twin lead cable to full length during FM RF alignment.

To avoid splitting the slotted head of iron core tuning slugs in the IF transformers, use a non-metallic alignment tool with a $\frac{1}{8}$ " wide blade. Do not exert undue pressure as threads of slugs may strip.

Be sure both the set and the signal generator are thoroughly warmed up before starting alignment.

AM ALIGNMENT PROCEDURE

- Connect output meter across speaker voice coil.
- Turn receiver Volume control fully on; Tone control fully clockwise.
- Band switch in AM position.
- AM antenna must be connected and placed in the same

- relative position to the chassis as when in the cabinet.
- Use lowest output setting of signal generator that gives a satisfactory reading on meter.
- Use a non-metallic alignment tool for IF adjustments.
- Repeat adjustments to insure good results.

Step	Connect Signal Generator	Dummy Antenna Between Radio and Signal Generator	Signal Generator Frequency	Receiver Dial Setting	Adj. Trimmers in Following Order to Max.
Before proceeding, be sure to follow instructions under heading "Important Preliminary Alignment Steps".					
1	Gang condenser antenna stator	.1 MFD	455 KC	Tuning gang wide open	*A-B (2nd IF) *C-D (1st IF)
2	"	"	1620 KC	"	E (oscillator)
3	Place generator lead close to loop of set to obtain adequate signal. No actual connection (signal by radiation).		1400 KC	Tune in signal	§F (antenna)

* Adjustments A and C made from underside of chassis.

§ AM antenna trimmer adjustment "F" in step 3 should be repeated after set and antenna have been installed in cabinet. Important: AM antenna trimmer may not peak if antenna leads are not properly routed or separated.

FM IF AND RATIO DETECTOR ALIGNMENT

- Keep VTVM leads well separated from signal generator leads and chassis wiring.
- Band switch in FM position.
- While peaking IF's, keep reducing signal generator output

so VTVM reading is approximately —1.5 volts DC with exception of Step #5.

- FM antenna disconnected during alignment.
- Trimmer adjustments "G", "H" and "J" made from underside of chassis.

Step	Connect Signal Generator	Generator Frequency	Receiver Dial Setting	Output Connections	Adjust (very carefully)
Before proceeding, be sure to follow the instructions given under "Important Preliminary Alignment Steps."					
1	Thru .001 cond. to pin #1 of 6BA6 2nd IF (Ground to chassis, close to tube).	±10.7 MC	Tuning gang wide open	Connect VTVM (DC probe) from point "P" to chassis.	"C" (ratio detector primary) for maximum reading on VTVM.
2	**Thru .001 cond. to pin #1 of 6BA6 1st IF. (Ground to chassis, close to tube).	"	"	"	"H" and "I" (2nd IF trans.) for maximum reading on VTVM.
3	Across ends of FM antenna twin lead.	"	"	"	"J" and "K" (1st IF trans.) for maximum on VTVM. Readjust G, H, I, J, K, for maximum. (Keep reducing generator output to keep VTVM at 1.5 volts.)
4	"	a. Reduce output of signal generator until VTVM reads EXACTLY —1.5 volts DC. b. Tune generator frequency above 10.7 MC until VTVM reads EXACTLY —1.0 volt. Note EXACT generator frequency. Extreme care in reading this is essential. c. Tune generator frequency below 10.7 MC until VTVM reads EXACTLY —1.0 volt. Note EXACT generator frequency. Extreme care in reading this is essential. d. Add generator frequency in step c to generator frequency in step b and divide by 2. The result is the center frequency of the IF curve to be used in step 5. See example under heading "Setting Signal Generator to Center of IF Selectivity Curve." e. Tune generator frequency above and below 10.7 MC and note voltage reading on VTVM at different frequency points until you have a good impression of the shape of the selectivity curve. If you have two peaks as in Figures D or E, note readings (voltage) of both peaks. If one peak is over 20% higher than the other one, it will be necessary to realign IF's. A selectivity curve that would require realignment is illustrated by Figure F.			
5	"	Center of IF selectivity curve per step 4d above.	Tuning gang wide open	Connect VTVM (DC probe) from point "R" to chassis. Use zero center scale if available.	"L" (ratio detector secondary) for zero voltage reading on VTVM. (The correct zero point is located between a positive and a negative maximum.)

If any of the above adjustments were very far off it is desirable to repeat steps 3, 4 and 5.

** Do not feed IF signal into converter grid as this will cause mis-alignment.

‡ Signal may be unmodulated or 400 cycle AM modulated.

SETTING SIGNAL GENERATOR TO CENTER OF IF SELECTIVITY CURVE

CAUTION: Due to the difficulty of setting a signal generator to the accuracy required by this operation, extreme care must be exercised in making each setting. Otherwise, improper alignment of the ratio detector and consequent audio distortion will result.

EXAMPLE: (See Figures A and B)

Voltage reading in step 4a is —1.5 volt.

Generator frequency on low side of 10.7 MC for a reading of —1 volt DC = 10.640 MC.

Generator frequency on high side of 10.7 MC for a reading of —1 volt DC = 10.800 MC.

Center frequency is obtained by adding 10.640 and 10.800, then dividing by 2. For these readings it will be 10.72 MC.

Set generator frequency to 10.72 MC as this is center of selectivity curve as shown in Figure B.

Note: Numerical vernier dial readings may be used instead of MC.

TYPICAL SELECTIVITY CURVES

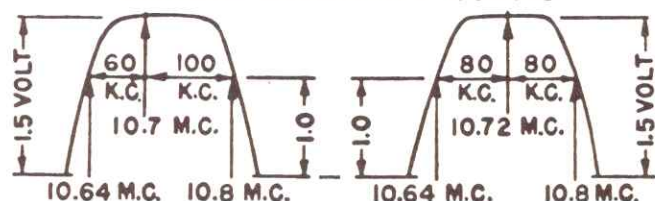


Fig. A

Fig. B



Fig. C



Fig. D



Fig. E

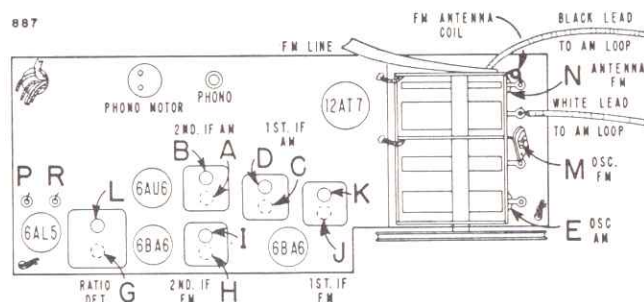


Fig. F

Figure 35. Trimmer Locations.

Adjustments A, C, G, H, J made from underside of chassis.

AM antenna trimmer "F" at rear of antenna.



FM RF ALIGNMENT PROCEDURE

Step	Connect Generator	Generator Frequency	Receiver Gang or Dial Setting	Output Connections	Adjust as follows (very carefully).
1		†109 MC	Gang fully open	Connect VTVM (DC probe) from point "P" to chassis	*M (oscillator) for maximum.
2	To ends of FM antenna twin lead thru 120 ohm carbon resistors in series with each generator lead. Stretch twin lead cable to full length during this alignment.	109 MC	"	"	*Adjust N (antenna) for maximum VTVM reading, while rocking signal generator. If trimmer does not peak, squeeze or spread turns of FM antenna coil.
3		87 MC	Tune in Signal. (Gang should be closed or almost closed)	"	If signals in steps 1 and 3 will not tune in at gang tuning extreme (within 0.5 MC), it will be necessary to spread or squeeze oscillator coil turns and then repeat steps 1 and 3 until correct results are obtained.
4		106 MC	At 106 MC (See Fig. 37)	"	Readjust M (oscillator) for maximum.
5		109 MC	Gang fully open	"	Readjust N (antenna) for maximum VTVM reading, while rocking signal generator. Check tracking and calibration at 106 and 92MC. See Figures 36 and 37. Calibration error should not exceed ± 0.5 MC. If necessary, repeat alignment until correct results are obtained.

* It is advisable to adjust generator output so VTVM readings do not exceed approx. —1.5 V. DC while peaking.
† Signal may be unmodulated or 400 cycle AM modulated. If your signal generator does not reach this frequency, use harmonics as described in "FM Alignment Equipment".

IMPORTANT

After completing alignment, assemble chassis cover and dial scale to chassis. Set dial pointer as shown in Figure 36. Recheck dial calibration for AM and FM tuning. The AM and FM oscillator or antenna trimmer adjustments may be touched up for more accurate calibration and tracking.

Repeat AM antenna trimmer adjustment "F" in step 3 of "AM Alignment Procedure" after receiver and antenna have been installed in cabinet. Note: AM antenna trimmer may not peak properly if antenna leads are not properly routed or separated.

Locating 109, 106 and 92 MC Settings With Gang Drum

Fully open the gang condenser. This is the 109 MC setting. Make a pencil line on the edge of the gang drum as shown by the arrow marked "109 MC" in Figure 37. Then to locate the 106 MC or 92 MC settings, merely rotate the gang drum until the pencil line corresponds to the dotted line positions (marked 106 MC and 92 MC) shown in the illustration.

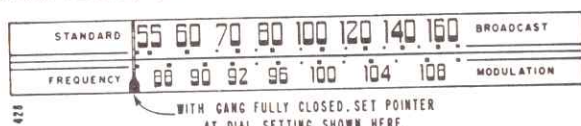


Figure 36. Pointer Setting.

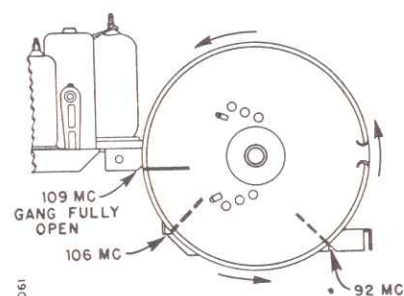


Figure 37. Locating Alignment Settings.

ADDITIONAL SERVICE HINTS

(These hints did not appear in earlier printing of this manual, dated 7-1-50.)

ELIMINATING AUDIO HUM

Strong audio hum (60 cycles) is generally due to one of the causes listed below, which can easily be corrected.

1. The volume control ground lead may be connected to the grounded heater lug of audio amplifier V204 instead of to the grounded **cathode** lug.
2. The AC power leads to switch SW501 on the volume control may run too close to the grid circuit of audio amplifier V204. Dress the leads to keep them away from this critical circuit. Later production sets use a retaining lug on the chassis to keep these AC leads dressed properly.
3. Coupling condenser C211 between volume control R212A and the grid of audio amplifier V204 may be reversed. For minimum hum pickup, the outside foil must be connected to the volume control.

VERTICAL BARS ON LEFT SIDE OF PICTURE

Vertical bars at the left of the picture may be reduced to a minimum by inserting a filter network between horizontal output transformer T404 and deflection yoke T403. This filter assembly is available under part number A3459S. **To be effective this filter must be mounted inside the high voltage shield.**

Connect the filter in series with the lead between terminal 4 of horizontal output transformer T404 and pin 5 of damper tube V408 (6W4GT).

Note: This trouble should not be confused with vertical lines produced by misadjustment of the horizontal drive.

REMOVING RETRACE LINES

In some areas, where the signal strength is low, it is often desirable to operate a receiver with the contrast reduced and the brightness turned up. Under these conditions several bright retrace lines may be visible in the

picture. If the following changes are made, the brightness control may be turned fully on without the retrace lines being visible. The best way to apply these changes is to check the schematic diagram and pencil in the changes before actually making them.

To add these changes to the circuit proceed as follows:

1. Connect a 270,000 ohm, $\frac{1}{2}$ watt resistor (part number 60B8-274) in series with the wire going from pin 2 (grid) of picture tube V307 to the junction of condenser C312 (.047 mfd.) and Brightness control R323.
2. Reverse the connections of the vertical wave shaping network R410 (8,200 ohms) and C406 (.05 mfd.) by connecting condenser C406 to pin 6 (grid) of V402 (6S4) and resistor R410 to chassis ground.
3. Connect a .05 mfd. condenser (part number 64B5-22) from pin 2 (grid) of the picture tube to the junction of resistor R410 (8,200 ohms) and condenser C406 (.05 mfd.).

NOTE: If portions of the picture appear to be smeared, use a 47,000 ohm resistor in place of the 270,000 ohm resistor. Also, if shading at the top of the picture is evident, reduce the condenser value in step 3 to as low as .001 mfd.

HIGH SYNC BUZZ LEVEL AND PICTURE SHAKE

High sync buzz level accompanied with picture shake may be due to breakdown between windings of the vertical output transformer T402. This trouble can be identified by change in pitch of the sync buzz with rotation of the vertical hold control. Replacement of the vertical output transformer T402 should remedy this trouble.

Vertical output transformer, part number 79B39-1, is used as a service replacement for the original transformer, part number 79B29-1. Transformer 79B39-1 has four leads; the white and yellow leads connect together.

Admiral Corporation

CHICAGO, ILLINOIS